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How Tax Incentives Affect Decisions to Invest in Developing Countries

Robin Boadway
and
Anwar Shah

The design of investment incentives in developing economies should reflect consideration of their effects on the marginal effective tax rate, on firms likely to suffer losses, on cash flows, on foreign-owned firms, and on the way capital is allocated among assets.

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This paper — a product of the Public Economics Division, Country Economics Department — is part of a larger effort in the department to evaluate public policies for private sector development in developing countries. The study was funded by the Bank's Research Support Budget under research project "An Evaluation of Tax Incentives for Industrial and Technological Development" (RPO 675-10). Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Carlina Jones, room N10-063, extension 37754 (November 1992, 117 pages).

Boadway and Shah contend that in evaluating and designing investment incentives in developing economies, analysts should consider their effect on:

The marginal effective tax rate (METR). Even simple tax incentives can perversely affect the METR. Many schemes have relatively generous write-offs to begin with, so generous that a negative marginal effective tax rate is not uncommon. In these circumstances, tax rate reductions (including tax holidays) can discourage investment. Investment tax credits are more likely to be effective.

Loss firms. Incentives that do not have generous loss-offsetting or refundability provisions will be of limited use to firms likely to suffer losses (including small growing firms and firms in risky environments).

Cash flows. Incentives that improve firms' cash flows may be more effective that those that do not. Refundability may be important here. Simply adopting cash-flow costing principles with refundability may be more effective than reducing tax rates.

Foreign-owned firms. If the value of a tax incentive is fully offset by reduced credits for foreign taxes, the incentive effect will probably be minimal.

Capital allocation among assets. Some measures favor short- over long-lived capital, machinery over inventory, some industries over others. Incentives that encourage investment selectively may cause distortions in the way capital is allocated.

Other factors to be considered in designing tax incentives:

- Inflation, which is typically high in developing economies. Incentives should offset the effects of inflation.
- Tax evasion, a common problem in developing countries.
- Technology transfer.
- The fulfillment of social, environmental, and regional non-economic objectives.
- The effects on firms' organization (do the incentives encourage mergers, takeovers, or bankruptcy?).

Perspectives on the Role of Investment Incentives in Developing Countries

by
Robin Boadway and Anwar Shah*

* We are grateful for the assistance provided by Alan Douglas and Marianne Vigneault in the preparation of this paper.

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PERSPECTIVES ON THE ROLE OF INVESTMENT INCENTIVES IN DEVELOPING COUNTRIES

by

Robin Boadway and Anwar Shah

I. Introduction

The purpose of this paper is to survey the role of investment incentives in developing countries. The use of investment incentives is by no means unique to developing countries. Industrialized countries also make widespread use of such incentives, and they take a wide variety of forms. Yet, there are some key forms of incentives which are especially common in developing countries as well as some unique institutional features which make it worthwhile addressing their role separately. Given the number and types of developing countries, and their special economic features, we cannot do justice in a single paper to the detailed problems of each. Instead, we take a more general perspective and focus on what we take to be a few key characteristics and effects of investment incentives used in developing countries.

Our paper begins with a broad survey of some of the general design issues in applying investment incentives in developing countries. The more common instruments used for encouraging investment in developing countries are presented. We then spend some time discussing the economic rationale for providing special investment incentives rather than simply letting the unfettered market determine the allocation of resources to investment. The issue is one of examining the possible sources of capital market failure in developing countries, and asking whether these can form a basis for encouraging investment. Some of these reasons reflect special features of developing countries, including problems of information and uncertainty, the important role investment plays in the growth process, and the heavy reliance on foreign-owned capital. Particular attention is paid to outlining the role of the corporate tax since many incentives are delivered through that tax system.

We then turn to a discussion of how to measure the impact of investment incentives. This involves adopting the methodology of marginal effective tax rates to the institutional setting of developing countries. Some of the problems encountered in providing investment incentives there become clear in

this discussion. These include particularly the problems of providing investment incentives in economies in which a good deal of investment takes place in risky activities, in firms which are in a loss position, and in which foreign capital is important. We illustrate some of these problems with a case study using the Malaysian tax system.

Finally, we provide a summary of the recent empirical work that has been done to estimate the effectiveness of investment incentives in developing countries.

II. Investment Incentives in Developing Countries: Types of Instruments and Frequency of Use

A. Some Issues of General Relevance

As outlined below, there are a wide variety of types of investment incentives used in developing countries and they might be expected to have differing effects. Yet, there are a number of common issues which affect many of these incentives and which we repeatedly refer to in the analysis to follow. The purpose of this section is to highlight up front some of the more important of these issues and to discuss their relevance for the evaluation of investment incentives.

The first of these concerns whether or not the incentives are *discretionary* or *automatic* policy instruments. Discretionary investment incentives are those which are implemented on a case-by-case basis by administrative decision. There may, of course, be general rules that the administrators follow. However, the decision as to whether to award an incentive is contingent on administrative approval. Automatic incentives, on the other hand, are those which are available to any firms meeting certain stated objective criteria. Examples include type and size of investment, location of firm, ownership of firm, profitability of firm, etc.

Economists stress the advantages of using automatic policy instrument whenever possible. Such instruments reduce the uncertainty attached to incentives, reduce the planning time for investments, and reduce the possibility that non-economic considerations or favoritism will enter the decision. Presumably they also reduce the costs of administering the incentives. On the other hand, it could be argued that discretion allows the administrators to be more selective in awarding grants and thereby increase the cost-effectiveness of them by screening out infra-marginal projects.

In practice, the line between discretionary and automatic incentives may not be clear-cut. The criteria for eligibility may themselves require administrative decisions, the more so the more selective the incentives are intended to be. Furthermore, administrators will rarely be fully informed about whether the firms using incentives are fully entitled to use them. Enforcement and compliance will necessarily require some administrative participation. Therefore, incentives will differ only in the degree

to which they are non-discretionary. We take the general view that less administrative discretion is a good thing.

Another general issue concerns the it *treatment of tax loss firms*. Many incentives operate through the tax system and ultimately influence the firm by affecting the tax liabilities of the firm. Furthermore, many of the firms eligible for incentives are in a non-taxpaying position, if only temporarily. In fact, these may be precisely the types of firms for which incentives would be most socially beneficial. For firms that are in a non-taxpaying position, the incentives will increase the size of "negative tax liabilities" held by the firm. It is important to know whether these negative tax liabilities are treated symmetrically with positive ones, that is, whether they actually give rise to tax refunds or their equivalent.

Fully symmetric treatment of positive and negative tax liabilities would require refundability of all negative tax liabilities. Failing that, unlimited carry forward (and backward) with full interest would be equivalent in present value terms, though it would give rise to a different cash flow for the firm. The appropriate interest cost to ensure present value equivalence would be problematic, however, for firms which faced credit constraints on capital markets. Partial loss offsetting measures might involve the carry forward and backward of losses, but probably for a limited time period only and without interest. Compared with full loss offsetting, this would be like the firm giving an interest-free loan to the government. Loss offsetting provisions may differ from one component of the firm's tax base to another. For example, depreciation allowances may be taken at the discretion of the firm, which is equivalent to extending the carry forward of losses arising from this type of capital cost. Also, some types of investment incentives, such as investment tax credits, might be refundable even though other components of tax liabilities are not.

Loss offsetting is important for ensuring that the tax system applies uniformly across different types of firms. The sorts of firms that are in a negative tax liability position would generally include small growing firms, firms engaged in large risky projects, and perhaps declining firms. Furthermore, the small growing ones might be in a cash-constrained position given their relatively large investments and given the fact that they may not have established a reputation for themselves on the capital market. The absence of full loss offsetting would tend to discriminate against risky investments, precisely those that might have a high expected return. It would discriminate against small growing firms that might already have a high cost of capital because of imperfections on the capital market. Anything short of full refundability would serve to worsen their already tight cash flow position. The absence of refundability might also postpone the exit from the market of firms that are declining. They have an incentive to stay

in business to write off as many of their capital costs as they can. Finally, refundability will be important in cases where the credibility of the government is suspect. In this case, uncertainty about future government actions will cause firms to discount future funds from the government relative to those received up front. Thus, refundable investment tax credits will be more valuable to the firm than the equivalent present value of funds received, say, though future tax reductions.

A third important distinction is between *it temporary* and it *permanent* incentives. Some incentives may be introduced for a limited length of time, or they may be available to the firm for only a fixed period. In this case, the incentive may have as its primary effect a change in the timing of the firm's investment rather than a change in the level of its capital stock in the long run. On the other hand, there may be circumstances in which a temporary incentive to invest may have a permanent effect on the fortunes of the firm. This will be the case if there are capital market imperfections which discriminate against young firms starting up (e.g., infant industry arguments).

Incentives may differ in the degree to which they are it *selective* rather than *general*. Selectivity may be according to various criteria, such as type of asset, type of sector, ownership, location, etc. In the absence of market inefficiencies, selectivity of incentives will introduce distortions in the allocation of capital across sectors.

One final consideration which is important in evaluating investment incentives is the extent to which capital markets are it *open* to the rest of the world so capital can flow freely into and out of the country. Typically, developing economies will be capital importers and will rely heavily on foreign investment. The tax treatment of foreign investment will influence the incentive for foreign firms to invest in the host (developing) country. Furthermore, foreign investors will typically be faced with tax liabilities in their home country and will have opportunities to invest in alternative locations. This means that the interaction of the host country tax system with that of the home country one will be important in determining the effectiveness of investment incentives. For example, under a system of foreign tax crediting (where the foreign investor receives a credit in the home country for taxes paid abroad), investment incentives could simply reduce foreign tax credits of firms operating in the host country and have little or no effect on the actual incentive to invest.

B. Types of Instruments to Encourage Investment

Developing countries have traditionally given a wide variety of special preferences to encourage investment broadly or in specific sectors and regions. The most typical of these incentives include tax rates differentiated over time, size, location, ownership and activity of firm; accelerated capital

consumption allowances; and investment and employment tax credits and allowances. These and others are briefly discussed in the following paragraphs. Further details are provided in Appendix A.

1. *Preferential Tax Rates*: Certain types of firms may receive lower tax rates than others, either on a temporary or on a permanent basis. The use of preferential tax rates is a blunt instrument for providing investment incentives since the incentive does not vary with the amount of investment done. Furthermore, the absence of full loss offsetting provisions often renders the incentive relatively ineffective. Also, if marginal tax rates are already very low, the incentive effect is minimal.

An extreme case of this is a *tax holiday* whereby a firm is tax-free for a given period of time. Tax holidays may be awarded on a discretionary basis to firms in designated industries or areas. Firms awarded tax holidays are typically those just starting up, and are referred to as "pioneer firms." This is a widely-used incentive in developing countries, and is currently practiced in Pakistan, Malaysia, Morocco, Thailand, Brazil, Bangladesh, Lesotho and Cote d'Ivoire. Of these, Morocco and Lesotho have extended tax holiday provisions to foreign investors as well.

2. *Investment Tax Credits and Allowances*: Under an investment tax credit, companies in a specific industry, or more generally, are allowed as a deduction against their tax liabilities a fraction of expenditures on new additions to physical or R&D capital stock or employment. Tax credits can be granted for specific activities and, by providing a direct subsidy, can be more effective than rate reductions. (An investment allowance is similar in effect to a tax credit except it is a deduction from the taxable income for corporate tax purposes.) The effectiveness of them depends upon whether they are refundable, and therefore provide cash up front to the firm, and, if not, the extent to which they can be carried forward. The less generous the loss offsetting provisions, the less effective will the incentive effect be for firms in a loss position relative to others. These include firms which are small and growing and firms which are engaged in risky activities. Tax credits may be targeted to specific types of investments, both tangible and intangible, and they may be discretionary or automatic. They may reduce future depreciation allowances. In the case of foreign subsidiaries, a relevant consideration is whether or not the credits are offset by the system of foreign tax crediting. To the extent that they are, they may represent at least partly a transfer of tax revenues to foreign treasuries. An investment allowance is a deduction from the taxable income for corporate tax purposes. Mexico, Greece, Pakistan and Malaysia permit investment tax credits. Turkey provides 100% investment allowance for priority industries and scientific research and development.

3. *Fast Write-offs*: Certain types of costs may obtain an fast writeoff. Most commonly this is depreciation (capital consumption) allowances which can be accelerated (initial allowance), or can even be expensed. Intangible investments are also commonly expensed (R&D, exploration, advertising, etc.) In principle, any type of cost could be accelerated, including financing (interest) costs. Loss offsetting provisions are also relevant here. Certain types of write-offs may be "elective" in the sense that the firm has some discretion as to when to claim it. This is particularly attractive to firms in a loss position when carry forward is limited. Some countries combine elective depreciation allowances with tax holidays. Examples of acceletarted depreciation schemes include Brazil, which allows 50% or 100% depreciation in the first year for approved investment projects that contemplate 2/3 shift operation, and Malaysia, which allows qualified expenditures to be fully expensed in the first two years.

4. *Financing Incentives*: The government may provide incentives which reduce the cost of financing investments. A cash grant would be analogous to a tax credit in this regard. The cash granted may come with various strings attached. The government may provide financial assistance through an investment fund. It may provide cheap loans or it may provide public sector equity funds with the associated equity participation of the government. Financing assistance may also be provided through the tax system. The flow-through of tax write-offs to shareholders will be beneficial to firms in a loss position. Various methods of imputation of corporate taxes to the shareholders will reduce the cost of finance to shareholders. However, this is not so much the giving of an incentive as a removal of a source of double taxation.

5. *Employment Incentives*: While most incentives are directed towards investment, there can be incentives for employment of labour as well. These could be employment or wage subsidies, or tax credits. Manpower training programs could also be used. Mexico is an example of a country which allows an employment tax credit.

6. *General Policy Instruments*: In addition to policy instruments directed specifically at certain types of activities, more general policies will affect aggregate investment and its allocation among various uses. Examples include indirect taxes, tariffs, and the establishment of free-trade zones. Investments will also be influenced by infrastructure provided by the public sector such as industrial parks, roads, education, and the like.

7. *Technology Transfer*: Governments may have in place certain provisions which affect the transfer of technology from foreign firms. These include equity participation requirements, and the tax treatment of royalties and licenses. As well the threat of expropriation and uncertainty about future tax policies will influence the incentive for foreign investment. More generally, the existence of uncertainty makes cash up front more valuable than incentives providing benefits in the future.

III. The Economic Rationale for Investment Incentives

As we have seen, investment incentives typically operate through the tax system either directly or indirectly. That is, they ultimately reduce the tax liabilities faced by the firm, especially those accruing under the corporation income tax. A proper evaluation of incentives requires first an understanding of the role of corporate taxes. We begin this section by discussing the rationale for corporate taxes and their optimal design given that rationale. This is followed by a discussion of the efficiency of capital markets and possible sources of market failure. In light of the latter, the case for further intervention in the form of investment incentives is discussed.

A. The Role of Corporation Income Taxes

Virtually all countries levy direct taxes on corporations. Ultimately, these taxes will be borne by households so one might think that it would be ideal to tax households directly rather than indirectly through their ownership of corporations. The essential question to address is why corporate taxes are needed at all given the alternative of taxing households directly using personal taxes (or indirectly using sales taxes on their consumption purchases). Posing the question this way makes it clear that the corporate income tax is essentially supplementary to the personal income tax. It owes its existence to the fact that for various reasons an ideal tax system cannot be achieved by personal taxation alone. It is useful to distinguish three main reasons for having a corporate tax alongside personal and commodity taxes. We refer to these as the *withholding* function, the *rent-collecting* function and the *revenue-raising* function. We discuss each in turn.

1. The Withholding Function

One way to view the corporate tax is as a withholding device for withholding at source against equity capital income generated in the corporate sector. This is the conventional function of the corporate tax, at least in developed countries. The need for withholding arises because of the fact that corporate source income would not otherwise be fully taxed on accrual by the system of personal taxes. There are

two distinct types of reasons for this, each of which might call for a different type of corporate tax when considered in isolation. However, the corporate tax is called upon to satisfy both types of withholding functions simultaneously, and that makes its design more problematic and judgmental. The two types of withholding are as follows.

a. Withholding Against Resident Shareholders.

Most personal tax systems are designed with the intention of taxing income on as comprehensive a basis as possible. Among other things, this would require taxing capital gains as they accrue. However, this seems difficult to do; capital gains are typically taxed on realization, if at all. This implies that asset owners can postpone tax liabilities by not realizing capital gains as they accrue. One of the main ways they can do this is by retaining and reinvesting income within a corporation rather than paying it out. A corporation income tax provides a way for taxing at source equity income earned within the corporation.

If this were the only role for the corporate tax, the design would be straightforward. It would only need to be applied to retained earnings. Its rate might be the top personal rate of shareholders, and the corporate tax payments ought to be viewed as being taxes collected on behalf of the shareholders. This means that the corporate and personal tax systems ought to be integrated so that shareholders are credited with the taxes having been collected on their behalf. One way to do this might be simply to credit the corporation with the corporate taxes that had previously been paid on funds that are paid out to shareholders. This is referred to as the *dividend-paid deduction* system and it would seem to represent perfect imputation. Unfortunately, as we shall see below, this system is not likely to be suitable in an open economy context. A system of imputation, such as a dividend tax credit operating at the shareholder level, is required.

The imputation method becomes somewhat imperfect if the corporate tax itself is not applied uniformly. For example, if loss offsetting is imperfect, the effective tax rate paid by the firm will differ from the statutory rate. Suppose the imputation is achieved by a dividend tax credit system applied at a constant rate to all shareholders. If the rate is chosen to be that appropriate for fully-taxpaying firms, it will be imperfect for shareholders of tax-loss firms. On the other hand, different firms may face different tax liabilities as a matter of policy. In this case, if the imputation system were to reflect the differences in tax treatment of firms, it would essentially undo the preferential treatment intended for the firm by the corporate tax. This would argue in favor of a uniform dividend tax credit system.

A fully-integrated system would apply a dividend tax credit at a rate equal to the corporate tax rate, which in turn is set equal to the top personal rate. Let the corporate tax rate be u and the top personal rate be t. If the dividend tax credit rate is d, the effective personal tax rate on dividends received by shareholders in the top bracket is given by $\tau = (t - d)/(1 - d)$. This is because the dividend tax credit system works as follows. When a dollar of dividends is paid out, taxable income is grossed up by the dividend tax credit rate and so increases by $1/(1 - d)$. This is taxed at the shareholder tax rate t and a dividend tax credit at the rate d is allowed. A fully integrated system sets $u = t = d$ (so $\tau = 0$). If capital gains are not taxed, even on realization, this ensures that corporate equity income is taxed once and only once in the hands of the shareholders for those in the top bracket.[1] For those in the lower tax brackets, the system withholds more than required, but eventually gives credit when profits are paid out. These shareholders will effectively be giving a small interest-free loan to the government. Thus, the imputation system will not be perfect. However, since most shareholders are close to the top marginal bracket, this should not be a great problem.

In practice, there are a couple of reasons why full integration as described above may not be in place. For one, because the corporate tax must fulfill more functions than this one of withholding against resident shareholders, the corporate tax rate may not be set equal to the top personal rate. The dividend tax credit should then be equal to the corporate tax rate. If the latter is set below the personal tax rate there will be still some small incentive to retain funds within the corporation, and vice versa. For another, there may be a capital gains tax imposed on realized capital gains. If so, there will be some personal taxation implicitly applied to retained earnings, although at a lower effective rate. This means that the dividend tax credit can be set at less that the fully integrated rate.

Some domestic saving in corporations will be done in a form which is sheltered from the personal tax altogether. The most common example is saving in pension funds. There would be no need to withhold taxes against income accruing to pension funds, but in practice it is impossible for the corporate tax to treat such shareholders differently from taxable ones. This implies that full imputation should apply to these funds, although often that is not done in practice.

Finally, recall that the rationale for withholding against domestic shareholders was to tax capital income on accrual that would otherwise escape full taxation at the personal level. This presumes that comprehensive income is the chosen personal tax base. Many economists would argue that personal

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[1]This is discussed more formally in Boadway and Bruce (1992).

consumption has advantages over income as a direct tax base.[2] In fact, many tax systems which purport to tax income come closer to taxing consumption given the number of assets which are sheltered, such as pension funds, housing and other consumer durables, human capital accumulation, insurance and cash balances. If countries were to adopt a full consumption tax system, this withholding rationale would disappear. Even so, a corporate tax may still be needed to fulfill some of the other roles discussed below. If that role were the other withholding role, a system of imputation would still be desired.

b. Withholding Against Foreign Shareholders

Income accruing to foreign shareholders would also escape domestic personal taxation since the latter applies only to residents. If it is desired to tax foreign shareholders, a corporate tax could be used for this purpose (perhaps alongside withholding taxes). The ability to extract tax revenues from foreigners depends upon the tax systems facing foreigners in their home countries. Specifically, if the host country into which the foreign capital is imported is small relative to world capital markets, which will typically be the case, taxes can only be obtained from foreigners to the extent that the taxes are creditable against tax liabilities in the home country. Otherwise, any attempt to tax foreigners will result in capital leaving the country until the rate of return before tax rises to cover tax liabilities. Effectively, the tax is being shifted back to domestic factors of production. If host country taxes can be credited against home country tax liabilities, a pure tax transfer can be affected from the home country treasury to that of the host country. Since this is costless it should be fully exploited.

Typically, there are two sorts of capital income taxes which are creditable. Pure withholding taxes are creditable to the extent specified by tax treaties. As well, many corporate tax systems provide credits on taxes paid abroad. The credits are limited by the amount of home country tax liabilities, are calculated using the home country tax system and are available when dividends are repatriated. As well, full credit is usually only available on shares held in foreign-controlled affiliates, which accounts for most foreign direct investment. To exploit this tax transfer fully requires that the host tax system conform with the foreign one. If host country tax rates are too high, some foreign investment will be discouraged. If they are too low, the host country is forgoing costless tax transfer. Since most countries tax corporations on the basis of some notion of equity income, this is also the sensible tax base for host countries to adopt, despite the fact that for domestic withholding purposes only retained earnings need be taxed. It would not be possible for the corporate tax to apply differently to domestic and foreign

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[2] The arguments are well-known and are presented in Meade (1978) and U.S. Treasury (1977), among other places.

firms, since that type of discrimination designed to exploit the tax transfer from foreigners selectively would presumably result in host countries denying full crediting of taxes.

Note that this withholding role is conditional upon the host country tax system offering full credits for taxes paid by its resident corporations abroad. This is equivalent to operating implementing the corporate tax on a full *origin* basis. If foreign tax systems offered only deductions for taxes paid abroad rather than credits, no tax transfer would be possible.[3] Any tax levied on capital income by the home country would be shifted back to domestic residents by induced flows of capital abroad. One of the great mysteries of corporate tax policy, and one which is the subject of current research in the area, is why do creditor nations choose to use the origin principle for their corporate tax systems when by doing so they are simply inviting a tax transfer to debtor nations.

Given this second reason for withholding using the corporate tax, the question of integration with the personal tax becomes more contentious. Certainly one would not like to impute corporate taxes paid to foreign shareholders when dividends are paid out. To do so would simply undo the tax transfer which is the reason for taxing foreign firms in the first place. This essentially rules out the dividend-paid deduction as mentioned above. Any integration would have to be done at the personal level, say, by a dividend tax credit, so that only domestic shareholders are affected. This mixing of the use of the origin basis for the corporate tax with the residence basis for the imputation makes the integration an imperfect policy device. In an open economy, the saving side of the domestic capital market is effectively segmented from the domestic investment side. In the aggregate, the two need not be equal; the rate of return is exogenously given and does not serve as a domestic market clearing price. This means that tax measures that apply at the personal level influence the saving side of the market while measures applying to corporations influence the investment side. Given that imputation applies at the personal level while the corporate tax applies at the corporate level, integration effectively removes the tax on equity income at the personal level while leaving the corporate tax distortion intact. At the same time, interest income remains taxable at the personal level, but deductible for the corporation. Thus, households would prefer to hold equity while firms would prefer debt financing. Integration cannot remove this distortion on capital markets. As argued in Boadway and Bruce (1992), where this analysis is developed in more detail, this makes the case for taxing consumption rather than income at the personal level stronger.

These problems would be avoided under a corporate tax system which allows deductions rather than credits for foreign taxes paid. In this case, the only withholding role for the corporate tax would

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[3] This point has been long recognized in the literature. See, for example, Musgrave (1969), Feldstein and Hartman (1979), and Gersowitz (1988).

be against domestic shareholders since it would no longer be possible to transfer taxes from the foreign treasury. Integration could be achieved at the corporate level using a dividend-paid deduction. In this way, foreign shareholders would be exempt from tax and domestic shareholders would be taxed once on equity income. Interest and equity income would be treated on a par.

2. The Rent-Collecting Function

The theoretical taxation literature has stressed the desirability of taxing corporations in a non-distorting manner. The purpose of a non-distorting tax is to tax pure profits or rents. To do so the tax base must correspond with rents or economic profits. Measuring pure profits is extremely difficult to do since it involves measuring all real imputed costs on an accruals basis, including true depreciation, asset depletion, costs of risk and finance, etc. However, as is well-known, the equivalent can be achieved in a feasible way by using a *cash flow* tax. Should a cash flow tax not be palatable because of the way it postpones tax liabilities of the firm, any tax base which is equivalent in present value terms will do. An example of such a scheme which is flexible and easy to implement is presented in Broadway and Bruce (1984). If such a tax were to be used, no imputation would be desired since it would undo the purpose of the tax.

While it is easy to see why economists would find a cash flow-type tax attractive, it is not clear that it makes much sense as base for a corporate tax. For one thing, a cash flow tax is not compatible with the withholding function, which is a main role of the corporate tax. For another, one cannot identify the rent-generating sector with the corporate sector. One would expect that a good portion of the latter would earn only a market rate of return. It might be better to target a rent tax to those sectors most susceptible to earning rents. A prime candidate would be the resource industries. Most countries already impose special taxes on them at least partly for the purposes of giving the public sector a share of the rents. It might be better to direct cash flow taxation specifically to those sectors rather than to the corporate sector as a whole. This would mean revising inefficient resource taxes such as severance taxes (royalties) and other levies which do not properly account for costs.

One interesting phenomenon that is often observed in developed countries is that corporate tax systems often favor precisely these industries. Special tax measures such as depletion allowances and the rapid write-off of exploration and development expenses imply that effective tax rates on resource industries (both marginal and average) are less than for other industries.

3. The Revenue-Raising Function

In developing countries, many taxes are costly to use in the administrative sense of compliance and enforcement, especially direct taxes. A good part of what should be included in income escapes taxation because of difficulties in detection and measurement. In these circumstances, a tax on corporations may be a relatively efficient way to raise revenues since there are fewer taxpayers and evasion may be more difficult. The use of a corporate tax simply as a revenue-raising device alongside personal and indirect taxes might be reinforced if capital incomes are otherwise difficult to detect at the personal level. A corporate tax used for revenue-raising purposes presumably need not be integrated with the personal tax, although this means double taxation of capital income and the discouragement of saving and investment.

In an open economy, the extent to which the corporate tax can be effective at raising revenue from capital owners is limited. As mentioned above, except to the extent that tax payments are credited abroad, a tax on foreign-owned capital imposed by a small economy will end up being shifted back to other less mobile factors of production such as labor and will leave the economy with less capital. It may be more efficient to tax the immobile factors directly, if possible. Even if the economy is large enough to have some effect on its return to capital, say, due to country-specific risk, a corporate tax would not be useful in exploiting it. What the country wants to do in this case is to increase the amount of capital imported, and this would be achieved by subsidizing capital, not taxing it. We return to this below in our discussion of investment incentives.

To summarize this discussion, the main reason for a corporate tax is for withholding, both against domestic shareholders and against foreign-owned firms. A subsidiary reason might be simply to raise revenue in an economy where no tax is perfect. Since the corporate tax cannot treat foreign firms differently than domestic ones, a common tax must satisfy all objectives. The withholding functions can best be satisfied by a tax on corporate equity income defined in a similar way to that of capital-exporting countries. Also, to take full advantage of foreign tax crediting systems, the tax rate should be comparable to that used in creditor countries. An imputation system could be put in place, but it must be done through the personal tax side (i.e., on a residence basis). If there is full imputation, capital gains taxes are not necessary. Whether or not there is an imputation of corporate taxes at the personal level, the corporate tax will distort the investment side of the capital market, and will leave firms with an incentive to finance by debt rather than by equity. This could only be avoided if all countries were to move from a system of foreign tax crediting to one of deductibility of foreign taxes. In this case, imputation would be better done by a dividend-paid deduction, and corporate taxes would effectively be levied on a

residence basis. This system could be achieved if creditor nations would move unilaterally (and independently) to a system of deductions. What is unclear is why they have not done so already.

B. The Efficiency of Capital Markets

Investment incentives involve interfering with capital markets to encourage particular types of investment. The justification for this would seem to imply some sort of inefficiency in the way capital markets allocate investment. In this section, we summarize the various sources of market failure on capital markets. This will serve as a basis for considering the rationale for investment incentives in the following section.

1. Capital Income Taxes

We have already seen that in an open economy a corporate tax will impose an unavoidable distortion on investment, even if it is imposed optimally. This is part of the consequence of using the corporate tax as a withholding device both against foreigners and against domestic residents on their accrued capital income earned in corporations. In a closed economy, this distortion could be avoided by reducing capital income tax rates. The extent of the distortion on capital markets would be determined by trading off the equity gains of taxing capital income with the efficiency costs of distorting investment. In an open economy, the distortion arises partly because the corporate tax is being used to transfer funds from foreign treasuries to the domestic one. Because of tax crediting arrangements, this does not affect the allocation of foreign-owned capital, but domestic capital accumulation is discouraged.

Investment incentives could only represent an effective policy instrument to the extent that they could be made to apply to domestically-owned capital rather than foreign-owned capital. If they applied to the latter, they would only serve to reduce the tax transfer from foreign treasuries by reducing creditable tax liabilities. Also, tax measures operating on the personal tax side, such as imputation and tax sheltering, would have no effect on the investment distortion, though they would encourage saving.

2. Dynamic Inefficiency

Inefficiency exists when it is possible to make some persons better off without making anyone worse off. The so-called *Fundamental Theorems of Welfare Economics* state that, under a set of conventional assumptions, i) all competitive equilibria will be efficient and ii) all efficient allocations can be supported by a competitive equilibrium. In a dynamic setting, this principle is applied to an economy evolving over an indefinite period of time. Dynamic inefficiency exists if it is possible to make one

cohort better off without making any cohort worse off. The basic result in the literature is that a competitive allocation which is efficient in the static setting will be dynamically efficient unless the rate of return on capital is below the rate of growth of the economy into the indefinite future, that is, unless the economy is "over-capitalized". In a finite-horizon economy, or in an infinite-horizon one in which the rate of return on capital is at least as great as the rate of growth (or becomes so in the future), the two fundamental theorems of welfare economics apply.

Empirically, it would be virtually impossible to make the case that actual economies are dynamically inefficient, especially developing ones. Rates of return on capital (before tax) seem to be well above rates of growth of modern economies. Furthermore, in principle, to know whether an economy is dynamically inefficient would require knowing the relationship between the rate of growth and the rate of return on capital into the indefinite future, and that is clearly not possible. Thus, it is difficult to base arguments for capital market failure on dynamic inefficiency. Moreover, even if dynamic inefficiency did exist, investment incentives would not be called for. On the contrary, dynamic inefficiency is associated with too much capital accumulation so measures would have to be taken to reduce investment.

3. Intergenerational Externalities

A common form of market failure is externalities or public goods. Some economists have argued that saving for bequest purposes may have a positive externality associated with it.[4] The argument is that part of saving is for bequests and this is motivated by altruism toward future generations. If each saver gets utility from the well-being of all members of future generations and not just their own heirs, saving will yield external benefits which are not taken account of by individuals. This will lead to too little saving, or equivalently a market discount rate which is higher than the social discount rate. Government intervention to increase saving will be called for.

Valid though this argument may be, it is not clear that it could be used to make a case for investment incentives, especially in an open economy. If the root of the problem is undersaving, the appropriate remedy would be to provide incentives for saving rather than for investment. In an open economy, where the saving and investment side of the markets are segmented, investment incentives will do little to increase saving, except through general equilibrium effects. They would primarily encourage investment financed by foreign capital inflows. A further difficulty is that if altruism does exist,

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[4] This argument is due to Sen (1967) and Marglin (1963) who made the point in the context of the social discount rate literature.

measures to facilitate intergenerational transfers may be fairly ineffectual. As Barro (1974) has argued, attempts to make pure redistributive transfers among generations will be undone by rationale households with an intergenerational altruistic motive. Thus, saving for future generations can only be increased by providing relative price incentives.

Related to the possibility of intergenerational externalities are intergenerational equity arguments. Some generations will be better off than others depending simply on their date of birth. If one applied some intergenerational social welfare function, equity arguments may well call for a set of intergenerational redistributive transfers from better off to less well off generations. This possibility was recognized as long ago as Ramsey (1928) and was made operational by Eckstein (1957). The simple idea is as follows. Suppose that the growth rate of consumption (lifetime wealth) across generations is g, and the elasticity of lifetime utility with respect to wealth is ϵ. Suppose also that r is the rate of return on capital, n is the rate of growth of population and α is the rate at which the social welfare function discounts per capita utilities across generations.[5] Then the optimal rate of growth of wealth across generations would be that for which

$$g\epsilon = r - n - \alpha.$$

In the long run, the economy should approach a steady state in which $r - n = \alpha$. Per capita consumption should be rising over time as long as $r - n > \alpha$, that is, as long as the economy is out of the steady state. The rate of approach to the steady state depends upon the elasticity of the marginal utility of income, ϵ. The policy instrument for implementing the optimal policy in this case should be intergenerational transfers, not investment incentives.

Of course, the whole notion of optimal policy in this context is fraught with difficulties since it depends upon social values which are not objectively given. Two dimensions of social value enter the determination of optimal policy. One is the degree of social discounting, α, which affects the steady state to which the economy should move in the long run. The other is the degree of intergenerational inequality aversion, ϵ, which affects the path to the long run steady state. There is unlikely to be general agreement on what these should be, especially since some of the persons involved are not yet borne.

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[5] α could be defined so that cohorts with larger populations have proportionately higher weights. For example, α could equal $\hat{a} - n$ where $\hat{a}$ is the rate of discount of the future. Thus the social welfare function would be:

$$W = \sum_{t=1}^{\infty} \frac{u_t}{(1 + \hat{a})^t} (1 + n)^t$$

4. Externalities of Growth

The above type of capital market failure involved externalities on the saving side of the market. Externalities may also occur on the supply side. Recently several economists have stressed the possible importance of externalities in the process of economic growth. For example, Romer (1986) has argued that capital accumulation generates external benefits (e.g., technological improvements) to firms other than those undertaking the investment. The results hark back to those of the growth theories of the 1960s where the rate of technological change was made endogenous and dependent on the rate of investment.[6] They also bear some resemblance to the infant industry arguments of trade theory. In the context of growth theory, they are interesting because they can account for differences in the rate of growth of economies as well as differences in the levels of income achieved. To the extent that they are true we would expect to see a correlation between rates of investment and rates of growth in per capita incomes.

Scott (1989) examined the causes of the rate of growth of output in pooled data on 26 period averages for ten developed countries (with 19 out of 26 observations for UK, USA and Japan). He used a simple ordinary least squares regression with share of investment in output and the rate of growth of quality-adjusted employed labor force and the ratio of output per quality adjusted in non-residential output excluding agriculture in the country to that in the U.S. in a base year (considered as a "catch-up" factor) as the only explanatory variables. He found that, for the sample as a whole, nearly half of the growth in non-residential business output can be explained by changes in the share of investment. Scott further estimates that marginal social rates of return to investment in the U.K. (1951-73) and USA (1948-73) exceeded the marginal private return by about seven percentage points with the former averaging 12.6% and the latter 5.3%. A third of this gap is accounted for by taxation. Three other factors explain the rest of the gap: the "learning externality" (firms other than the investment undertaking firm benefit disproportionately from increased opportunities); the "demand externality" (firms selling in imperfect markets receive lower marginal than average returns because of higher marginal selling costs) and "animal spirits" (a positive externality based on a tendency for firms to value increases in output by more than their value to shareholders) (see Scott (1989), p.xlvi).

Since it is the act of investment *per se* which yields an externality, the appropriate would be to implement measures which influence investment directly. Policies operating on the saving side will not be effective. This may be the strongest argument for investment incentives. Indeed, it might also be the argument for incentives for investment in human capital and R&D as well. For example, Lucas (1988)

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[6] Some key references are Kaldor and Mirrlees (1962), Arrow (1962) and Kennedy (1961). This literature is surveyed in Hahn and Matthews (1965).

has argued that precisely the same sorts of externalities may be involved with human capital investment as others such as Romer have analyzed for physical investment.

5. Incomplete or Imperfect Capital Markets

Capital markets may not be perfectly functioning or complete for institutional reasons. A number of examples of these may be as follows.

a. Liquidity Constraints.

Households or firms may be liquidity-constrained. If households are prevented from borrowing early in life against their future labor income, they will be forced to consume less than the desired amount and aggregate saving will be higher.[7] Again, policies operating on the saving side of the market would be appropriate here rather than investment incentives.

Firms may be liquidity-constrained as well, especially, as noted above, young growing firms. Corporate tax policies can be of some help here to the extent that they make cash available to firms who are strapped for funds. Since many such firms are in a negative tax liability position, full refundability of tax losses would be helpful. Refundable investment incentives would also offset the effects of liquidity constraints.

b. Incomplete Markets for Risk.

Complete markets for the trading of risk require that the number of assets be as least as great as the number of possible states of nature. Given that the latter can be large, it is quite likely that such markets are incomplete. Furthermore, since government policy itself contributes to the risky environment in ways that cannot be foreseen, it would be very difficult to insure against future government policies. By offering less than full loss offsetting, tax policy itself may contribute to the inefficiency in trading in risk. There is no particular reason why the government should be any better informed than the private sector so it is not clear that the government can improve the efficiency of allocating risk except by making sure that tax policies do not distort it further.

One particular form of risk trading that the government may have a role in influencing is the sharing of risks across generations. Strictly speaking this is not an efficiency argument but an equity argument. However, it may be analyzed precisely as an insurance problem when cohorts are put behind

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[7] The consequences of this have been analyzed by Hubbard and Judd (1987).

the "veil of ignorance".[8] The argument goes as follows. Some cohorts are luckier than others because of their date of birth. The larger the cohort of a person, the less well off will that person be since they have lower wages in working periods when labor is more plentiful and lower capital incomes in retirement when labor is scarcer. In addition to this demographic effect, there will be productivity differences and other shocks, as well as business cycles which have a systematically different effect on some cohorts than others. Although there is a risk associated with when a particular person is born, it is "insurable" to society since the risks of being born at different times largely cancel out across different generations. However, there will be no market for insurance against time of birth because such insurance would have to be acquired before one knew their date of birth! However, the possibility exists for the government to provide "social insurance" by a set of intergenerational transfers from those who are less lucky to those who are more lucky. The existence of such intergenerational transfers will naturally influence saving and investment behavior. However, investment incentives *per se* are not involved.

6. Informational Asymmetries

Different participants in the capital market may be differently informed. The most common case is that in which the profitability of an investment or a firm is better known to some agent than to others. For example, persons in the firm may know more about the prospects of the firm than outside investors. Or, managers may know more than shareholders. These asymmetries in information will cause persons to behave differently than if everyone were perfectly informed. We are particularly interested in how investment is affected by asymmetries in information. In the literature there are two sorts of asymmetries of information which affect investment, adverse selection and moral hazard. We discuss each in turn.

a. Adverse Selection Models

Adverse selection occurs when some characteristic of the firm, such as its quality, is known to the firm but not to outsiders. In this case it will be to the advantage of the "high" quality firms to signal their quality by engaging in some activity which the lower quality firms find costly to mimic. Originally, signaling models were used to explain why firms might prefer one financial structure over another, given that with full information the Modigliani-Miller (1958) Theorem implied that the financial structure was irrelevant. For example, Ross (1977) argued that if managers face a loss in welfare when their firms go bankrupt, managers of firms with low probabilities of bankruptcy can signal their quality by taking on

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[8] For examples of such an analysis see Smith (1982) and Gordon and Varian (1988).

more debt. Signaling models of the financial structure of firms typically take the level of investment as fixed. However, their implication for investment can readily be inferred. Since signaling using financial instruments entails a cost, it will raise the cost of financing and thereby reduce the level of investment.

Investment *per se* may be used as a signal. For example, Miller and Rock (1985) consider a model where higher quality firms have higher cash flows and argue that firms will signal their quality (cash flow) by the size of their *net dividend* defined to be the payout of dividends less the use of external funds. To prevent lower quality firms from mimicking their behavior, they underinvest. Lower quality firms can only mimic higher cash flows by taking funds away from investment. Williams (1988) obtains a similar underinvestment equilibrium by considering a model in which the firms solve for an optimal mix of costly signals. Myers and Majluf (1984) also obtain a signaling equilibrium in which profitable investments may be forgone to avoid taking on external financiers who can benefit from the existing (known) wealth of firms.

In all of these cases of adverse selection, the fact that signaling is costly raises the cost of undertaking new investments and results in an equilibrium in which investment is below the full information level. This might be expected to give a *prime facie* rationale for encouraging investment, though the literature has not really addressed the issue. One problem is that the government is not likely to have any better information that the private sector. Any investment incentives will have to apply uniformly to all firms, both high and low quality.

There have, however, been some models in which overinvestment can result from adverse selection. For example, Heinkel and Zechner (1990) suggest that overinvestment can occur in the presence of adverse selection when securities are priced at the average or expected, value. In such cases a firm with a negative expected present value project may be able to sell overvalued securities that more than compensate its equity holders for taking a negative present value project. John and Senbet (1988) consider the case where limited liability of equity holders induces overinvestment. Overinvestment is perhaps less plausible than underinvestment if only because firms always have non-negative (i.e., zero) net present value investment options available to them outside the firm. It is not clear how it could be in the interest of shareholders to undertake negative net present value investments in the firm (that is, to overinvest) when zero present value assets could always be obtained on the capital market.

b. Moral Hazard Models

The effects of moral hazard (or *agency problems*) for investment have been analyzed for in two main contexts--conflicts of interest between equity holders and debt holders, and between inside

(sometimes owner-managers) and outside (sometimes new) equity holders. Several papers in this literature argue that agency problems are likely to lead to underinvestment. The classic papers are those by Myers (1977) and Jensen and Meckling (1976). Myers shows that there is a potential moral hazard problem between the firm (whose management is assumed to operate in the best interest of shareholders) and debt holders that can lead to underinvestment. The problem arises because the firm will raise capital for investment only if there is positive net present value to the existing shareholders. If the capital structure includes debt whose owners must be reimbursed before shareholders, new capital will be raised only if the returns are great enough to cover both the required repayment of debt and the required outlay for investment. This will lead to underinvestment since it would be efficient to undertake any investment with returns great enough to cover the outlay alone. The Jensen and Meckling paper is somewhat more general since it includes in addition to the conflict between equity holder and debt holders of Myers a conflict between insiders and outsiders. Managers who are fractional owners of the firm will want to consume too many perquisites since they receive all the benefits but bear only part of the cost. This possibility leads equity capital suppliers to pursue methods such as monitoring, covenants and the like which induce optimal behavior on managers. These additional costs lead to lower levels of investment. Other papers in the literature have come to the same conclusion of underinvestment, including recently Jensen (1986) and Schleifer and Vishny (1986).

One recent paper, Darrough and Stoughton (1986), has included both adverse selection and moral hazard in the same model. The adverse selection involves an unknown quality of manager while the moral hazard is the manager's unobservable effort. The equilibrium involves the owner-manager making an optimal trade-off among excess risk incurred, effort provided and communication of information. In doing so an optimal mix of debt and equity financing are used to shed risk, leading to real agency costs which again reduce investment.

7. International Tax Competition

From a national perspective, there may be gains from attracting capital from the rest of the world. In the literature, policies for attracting capital from other countries is often treated as being purely strategic in the sense that inflows of foreign investment will reduce the domestic rate of return and cause part of the burden of the taxes on the investment to be exported.[9] Alternatively, if there are rents associated with investments, governments will have a private incentive to reduce the tax on rents to attract

[9] See, for example, Bond and Samuelson (1989).

more capital and thus generate more domestic rents.[10] Finally, there may be terms of trade effects associated with capital inflows, as has been stressed in the trade literature.[11] In each of these cases, wasteful ("beggar-thy-neighbor") tax competition will be the result. Investment incentives are obviously the prime policy instrument for attracting foreign investment into a country. As mentioned, their effectiveness is contingent upon foreign tax crediting systems not merely causing them to transfer tax revenues abroad.

Informational asymmetries may also characterize international capital flows. Thus, foreign investors may not have full information about which countries are high profit countries and which are not. This is especially true if there is some uncertainty about future government policies. In this case, high return countries may want to "signal" their quality by offering special incentives to potential investors. Bond and Samuelson (1986) have used this as an argument for tax holidays in developing countries, a phenomenon which appears to be quite widespread. Since much of the uncertainty about investment returns in developing countries might come from uncertainty about future government policies and its effect on after-tax cash flows, incentives which improve cash flows up-front would probably be the most effective signals. It is not clear that tax holidays fall into this category, especially when marginal effective tax rates are low to begin with as discussed below. Refundable investment incentives, such as investment tax credits, would be more effective.

8. Distortions on Other Markets

So far our discussion has been entirely about market failure on capital markets. However, in developing economies, other markets may be significantly distorted and this may be relevant for evaluating the effects of investment incentives. Two markets in particular are liable to be distorted--labor markets and foreign exchange markets. The literature on project evaluation in developing countries deals largely with the issue of investment criteria when there are distortions on these markets.[12] On the basis of first principles, we know that distortions should be dealt with directly on the markets involved. However, where this is not possible, their implications for investment decisions should be dealt with on

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[10] The classic paper in this area is MacDougall (1960).

[11] See the survey in Harris (1989).

[12] For a general treatment, see Boadway and Bruce (1984b) and Dréze and Stern (1987). See also the various manuals for project evaluation in developing countries.

a case by case basis. Some general results which may be of relevance for investment incentives are as follows for each type of market distortion in turn.

a. Labor Market Distortions

The efficiency implications of labor market distortions depend upon the nature of the distortion. Labor market distortions, most of which show up as unemployment, can take several forms. Unemployment may be frictional and a result of the costly search process observed on labor markets. In this case inefficiencies may result from search externalities (Diamond (1981)) and a case can be made for subsidizing search, say through unemployment insurance schemes. Unemployment may be structural resulting from the adjustment of the economy to shocks of productivity, terms of trade, shifting tastes, etc. In this case, as shown by Mussa (1978), it is not obvious that the public sector can do any better than the private sector in adjusting to change. Unemployment may be temporary as modeled in the implicit contract literature (Baily (1974), Azariades (1975), Feldstein (1976)). In this case, unemployment may be exacerbated by government schemes such as unemployment insurance. Finally, there are efficiency wage types of arguments for unemployment where wages are set above the market clearing level to deter shirking or voluntary turnover, both of which involve costs to firms. As Shapiro and Stiglitz (1984) have shown, efficiency wages cause unemployment inefficiencies which can be addressed by wage subsidies, at least to those sectors subject to the problem.

In the context of developing countries, unemployment has often been modeled as a dual economy phenomenon arising from an exogenously-given high wage in the urban sector with unemployment as a migration equilibrium device. Harberger (1971) has argued convincingly in the context of this model that the market wage and the shadow wage are identical in the urban sector, and that therefore no special employment incentives are called for.[13] However, once the wage rate is made endogenous, say, by an efficiency wage argument the case for employment subsidies reappears.[14] One must set against this the theoretical arguments against efficiency wages as a source of unemployment. For example, Carmichael (1985) has argued that efficiency wages would not be necessary as a worker discipline device if workers could be required to post bonds (explicitly or implicitly) when hired.

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[13] See, however, Boadway and Flatters (1981) where a case is made for regional employment subsidies in a more general version of the Harris-Todaro model.

[14] In fact, one of the earliest models of efficiency wages was due to Stiglitz (1974) who used it to explain dual economy features of a developing economy.

In an efficiency wage context in which employment subsides are not available for whatever reason, investment subsidies may prove to be a useful second best instrument for increasing employment. For example, efficiency wages may be relatively more important in capital-intensive industries. If so, investment incentives may be a more selective instrument for dealing with the problem than employment incentives. If this is the rationale for investment incentives, it would call for permanent incentives rather than short-run ones so as to raise the level of employment permanently. Of course, investment incentives would not be fully efficient since they would serve partly to cause firms to substitute capital for labor.

9. Time Inconsistency of Government Policy

A key feature of investment is its intertemporal nature. Capital invested at one period of time yields returns into the future. To the extent that investment is irreversible, capital, once acquired, becomes a *quasi-fixed factor*. This gives rise to a well-known problem of time-inconsistency of government policy. A far-sighted government which is planning its future tax policies would naturally want to take into consideration the effect that future taxes have on current investment decisions and design them accordingly. However, if current governments cannot commit future ones to a predetermined set of tax policies, the quasi-fixed nature of accumulated capital stocks will provide an incentive for future governments to renege on the those tax policies. In particular, there will be an incentive to try to tax "old capital", whose return now takes the form of a quasi-rent.

If the government is unable to commit future governments to a tax policy, and if decision-makers correctly anticipate that this is the case, the result will be a rational expectations equilibrium in which the inability to commit is taken into account by all persons. This result has been analyzed in the literature in various guises (e.g., Fischer (1980), Chamley (1986), Bond and Samuelson (1989b)). The general result is the in the no-commitment equilibrium, capital tax rates are higher and investment is lower than in the full commitment (optimal tax) equilibrium.

In the context of developing countries, this has been thought to be a particular problem in the case of foreign firms operating in the country, presumably both because foreign investment is particularly important and because foreign investors might have less direct influence on government policy than domestic firms. The phenomenon is more widespread than tax policy. The use of expropriation is another way in which future governments can capture the quasi-rents of foreign investors. This has been analyzed by Eaton and Gersowitz (1981). More generally, the incentive to renege on foreign debt is another example of time inconsistency in developing countries. In all cases, the result is likely to be underinvestment, perhaps of a significant amount.

C. The Role of Investment Incentives

Given this discussion of the role of the corporate tax and the efficiency of capital markets we are now in a position to summarize the arguments for using investment incentives as policy instruments. The various arguments will also suggest some principles of design for investment incentives.

1. Offsetting the Corporate Tax Distortion

We have mentioned that in an open economy, if the corporate tax is used as a withholding device, it will impose a distortion on domestic investment. This will be the case regardless of whether an imputation system is in effect for domestic residents. The distortion will only apply on domestic-owned capital as long as the corporate tax rate does not exceed that which can be credited abroad. This suggests that investment incentives that apply at source to domestically-owned capital will offset the corporate tax distortion.

The difficulty with applying investment incentives for this purpose is that it should either be applied to domestic investment alone, or if it applies on foreign investment it should be such as not to reduce the foreign tax credit. Otherwise, much of the force of the incentive as it applies to foreign investment will be dissipated as a tax transfer to foreign treasuries. If a country tried to impose an incentive selectively on domestically-owned firms it is likely that foreign countries would see this as discriminatory and would disallow the normal foreign tax credit. On the other hand, it is not clear how investment incentives could be applied on foreign firms which would not reduce the foreign tax credit. Thus, it is not clear that investment incentives could do much to eliminate the unavoidable distortion of the corporate tax without undoing the withholding purpose of the tax in the first place.

One imperfect way in which this might be done would be to target investment incentives to specific sectors, in particular, those which are relatively highly domestically-owned. This would minimize the tax transfer abroad without at the same time appearing discriminatory. At the same time it would be distortionary since it would make the tax distortion different in different industries. Furthermore, if this were desired in the first place, it would be more sensible simply to have differential corporate tax rates across sectors, with higher rates in those sectors in which foreign ownership is the highest. In other words, the investment incentive should take the form of reduced tax rates.

2. Attracting Foreign Investment

Related to the above is the desire to attract foreign investment because of the net benefits of foreign investment such as the increase in tax base, the generation of employment, the transfer of

technology, and, where possible, the strategic exploitation of terms of trade and rates of return on capital. Again, the ability to do this is limited by the extent to which investment incentives applying on foreign investment can actually affect the behavior of foreign firms rather than simply transferring tax revenues abroad. If the investment incentives can be applied in a way which does not affect the foreign tax credit, then foreign investment can be attracted and all of its benefits (including the exploitation of foreign treasuries) can be achieved. However, it is unlikely that this can be done.

It may still be possible to attract foreign investment using investment incentives even though they reduce the foreign tax credit. Because foreign tax crediting is not instantaneous but only occurs when dividends are repatriated, the exploitation of foreign treasuries cannot be perfect. The existence of tax deferral implies that, even if foreign firms have not fully exploited their foreign tax credits, the domestic tax system will still have a marginal effect on investment financed by the retained earnings of the firm. [15] Thus, investment incentives will have some effect in attracting foreign investment, though at the expense of some tax transfer forgone when the earnings are repatriated. Once again, the way to exploit this is to set the corporate tax rate in the first place so as to achieve the appropriate trade-off between the distorting effect of the corporate tax, the induced inflow of foreign investment and the tax transfer from foreign treasuries. The setting of the tax rate will vary from country to country. Presumably it will not necessarily be optimal to mimic the foreign tax system. Instead there will be an incentive to set the domestic tax rate lower than that of the home countries of investing firms.

Since the imperfection of the foreign tax transfer arises because of the deferral of foreign tax liabilities until repatriation of dividends, this suggests that tax incentives might well be based on retained earnings specifically. In other words, the corporate tax system might apply differentially to dividends. Unfortunately this comes into conflict with the domestic withholding role which involves taxing retained earnings to prevent shareholders from postponing taxes by keeping their funds within the corporation. To the extent that capital income is taxed at the personal level, it will not be desirable to treat retained earnings preferentially in order to improve the withholding properties against foreigners.

3. Infant Industry Arguments

To the extent that infant industry arguments are valid, temporary investment incentives may be an effective device for assisting firms just starting up. From the point of view of instrument design, investment incentives will be superior to, say, tariff protection. To be effective such investment

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[15] This is analyzed in Leechor and Mintz (1990).

incentives must be designed to be of specific use to small growing firms. Many of these firms are in a non-taxpaying position and may be involved in risky projects. They may also be strapped for funds because capital markets may be characterized by asymmetric information such that creditors cannot tell "good" prospects from "bad" ones. These considerations would seem to imply that investment incentives should provide funds up front to young firms, and that refundability is a necessary feature. As we discuss later, reduced tax rates or temporary tax holidays may not have the required preferential effect. If marginal tax rates are low to begin with, tax rate reductions will not provide much incentive at the margin. If there is not full loss offsetting, it may provide no incentive. The benefit of tax rate reductions may also occur to far into the future to be of much help to liquidity-constrained firms. Measures which provide funds up front, such as investment tax credits, would be much more effective, though only if refundability is a feature of them. To the extent that infant industry arguments are the rationale, the incentives need only be temporary.

Again, it is worth stressing that in an open economy setting the use of tax incentives, temporary or otherwise, will be partly dissipated as tax transfers to foreign treasuries. This will be the case to the extent that foreign firms can take advantage of them. If it is possible to target temporary tax reductions to domestic firms without jeopardizing the tax credit status of foreign firms, the tax transfer can be avoided. This may be possible in practice. Some countries apply temporary tax incentives (e.g., tax holidays) on a discretionary basis.

If, in so doing, they can apply them discriminately to domestic firms rather than foreign firms, there will not be any reduced tax transfer from foreign treasuries. Of course, even for foreign firms temporary tax incentives are likely to have some stimulative effect on investment. Since these firms may not be in a profitable position when the incentives apply, any tax loss to foreign treasuries will be deferred. Thus, it may be still worth applying temporary incentives to them. Indeed, they may be preferable to permanent ones. We return below to another reason why it might be desirable to apply temporary tax incentives to foreign firms.

4. Externalities of Investment

One of the most convincing reason for encouraging investment is the argument that investment generates benefits for the economy over and above those which are captured privately by investors. These may take the form of innovation, learning by doing or labor training and can affect both the level and rate of growth of the economy. To the extent that this is true, there is a case for encouraging investment to be higher than it would otherwise be. Implementing policies to encourage investment

involves taking into account the open economy consequences of investment incentives. In an open economy, incentives for investment applied at source can be undertaken with little regard for the way in which capital income is treated at the personal level. The main constraint is the conflict between investment incentives and the role of the corporate tax as a withholding device against foreigners. A reduction in corporate tax liabilities will encourage investment, especially for domestic corporations. However, to the extent that they must be applied in a non-discriminatory way to domestic and foreign firms alike, they will involve a relatively large revenue loss on foreign firms compared with the extra investment they generate. This is the trade-off that must be judged when designing the corporate tax system. The more important are the externality arguments for investment incentives, the more would a country be willing to forgo the tax transfer of revenues from foreign governments and the lower would tax rates be relative to those in the home countries of foreign investors.

5. Creation of Employment

We have argued above that some forms of unemployment may reflect distortions on labor markets that can be offset by government policies. For example, if unemployment is caused by efficiency wages, employment subsidies would be appropriate. Also, frictional unemployment may be treated with subsidies to search. Typically these sorts of labor market distortions are best corrected by labor market policies. The use of investment incentives would generally be a second best policy. However, for some reason, political or administrative, labor market policies may not be available. Also, as mentioned, efficiency wage sectors may also be capital-intensive ones. There may therefore be a case for using investment incentives as a way of creating employment.

If this is the case, exactly the same issues are relevant as in *4* above. The employment-generating benefits of investment along with externality benefits will have to be set against the possible loss of tax revenues to foreign treasuries, assuming one cannot discriminate against foreign firms.

6. Risk-Sharing and Financing Problems

To the extent that capital markets are imperfect, some firms may be liquidity-constrained or may find it costly to undertake risky projects. This may be especially true for small growing firms who are short of internal finance and who cannot self-insure. These firms may be sensible targets for investment incentives, especially since the corporate tax itself may discriminate against them. As with $_3$ above, incentives which provide funds up front and in a refundable way are particularly attractive relative to,

say, tax reductions. The incentives could be limited to smaller, younger firms and could be temporary. The same conflict with the foreign withholding role as before also exists here.

7. Tax Incentives as Signals

As Bond and Samuelson (1986) have argued, temporary tax incentives may be used by countries as signals of their "quality" as locations for foreign investment.[16] To the extent that this is a valid argument, such tax incentives would presumably be more effective if they were designed like other temporary tax incentives; that is, if they got funds to the firm up front in a refundable way. The trade-off with the foreign withholding function, which was not part of the Bond-Samuelson analysis, would have to be addressed. The fact that tax incentives to foreign firms involves lost tax revenues to the foreign treasury makes them a costly, and therefore more effective, signal.

9. Tax Incentives to Overcome Time-Inconsistency Problems

Finally, as mentioned above, underinvestment can occur as a result of the inherent inability of governments to commit to future tax policies, especially those which effectively expropriate the future returns on quasi-fixed capital stocks. Since it is unlikely that mechanisms can be found which commit future governments to pre-determined tax policies, one is left with measures which work to offset the disincentive effects of time inconsistency. An obvious example of this involves investment incentives applied up-front. Tax holidays and investment tax credits would be good examples of such instruments. Again, the effectiveness of these would be contingent on them not being offset by foreign tax crediting regimes.

In summary, there are arguments both for permanent investment encouragement and for temporary incentives. In the case of the latter, the effect on cash flow is often very important. The effectiveness and cost of investment incentives is tempered considerably by foreign tax crediting arrangements. Investment incentives will typically involve an unavoidable loss in tax revenues to foreign treasuries, unless discriminatory provisions can be applied or unless the incentives can be applied selectively to sectors which rely less heavily on foreign capital.

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[16] Bond and Samuelson used tax holidays as the government's choice of instrument, but others would do as well.

IV. The Conceptual Impact of Investment Incentives

Investment incentives are intended to induce firms to invest more by increasing the rate of return from holding assets. They can do so in a wide variety of ways. Firms take a large number of capital decisions and investment incentives can affect each of them differently. Firms decide how much capital of various types to hold, when to acquire the capital, how durable the capital should be and how long to hold it. There are many different types of physical capital including depreciable capital of various sorts (e.g., machinery, buildings), inventory, depletable assets (minerals, oil and gas), renewable resources (forest), and real estate. In addition, There are various forms of intangible assets that firms invest in, such as R&D, advertising, human capital, and goodwill. The tax system can affect all these decisions. It can also affect the financial structure of firms, that is, the decision to finance using debt or equity instruments of various sorts. The choice of financial instrument, by affecting the cost of funds, will also affect real investment decisions. Finally, the tax system will affect in different ways capital decisions taken by different types of industries or firms. All of this suggests that the effect of investment incentives can vary greatly for different types of investment decisions in the economy. In fact, the same investment incentive can have quite different effects on different decisions. Any attempt to measure the impact is bound to be imprecise.

One useful summary device for measuring the impact of investment incentives is the *marginal effective tax rate*, hereafter the METR. The METR measures the tax wedge at the margin for a given type of capital demand, that is, the extent to which the tax system affects the marginal rate of return from holding the asset. The impact of investment incentives can be inferred by computing how the METR is affected by the incentive. In this section we outline the computation of METRs with special emphasis on some of the problems encountered with investment incentives in developing economies. Some sample calculations are presented.

Before doing so, it is useful to review some of the limitations of METRs. First and foremost is the fact that the METR measures only the size of the impact of tax measures on the rate of return. It does not measure the responsiveness of investment. This means that its usefulness will ultimately be limited to making qualitative judgments and to comparing alternative incentives. This drawback essentially arises from the fact that there is currently no acceptable and reliable technique for estimating investment demand empirically. It would therefore be futile to try and extend the use of METRs to determine the impact of investment incentives on actual investment. Our state of knowledge does not permit that. At the same time, the METR does have the offsetting advantage that it isolates completely tax considerations from others.

Another limitation is that there are potentially an almost indefinite number of METRs in the economy, each one associated with a different type of investment decision. This means that there must necessarily be some selectivity or aggregation involved in presenting METR calculations. In the end, METR calculations are essentially illustrative.

METR measures also presuppose a great deal about the structure of the economy and the process by which production and investment decisions are taken. For example, they typically assume competitive conditions and use some variant of the neo-classical theory of investment without adjustment costs as in Jorgenson (1963). They can, however, be extended to include adjustment costs with some additional assumptions. METRs are often computed for a risk-free environment, or at least one in which firms maximize only expected returns. When the costs of risk-taking are taking into consideration, it is in a fairly rudimentary way. The financial structure of firms is usually taken as given, though it is possible to measure the incentive effect of the tax structure on the financial structure of the firm. In the absence of an accepted financial theory, it is typically necessary to adopt some *arbitrage* assumption for the firm. That is, because the tax structure treats different types of financing differently, there will be a different tax wedge for different types of financial instruments. One must specify which side of the market bears the differential tax. (We return to the arbitrage assumption below.) The behavior of the firm is modeled quite simply as that of maximizing the present value of the stream of dividends to shareholders. Problems of management and labor, such as incentive problems of the principal-agent sort that have figured so prominently in both labor economics and the theory of finance, are essentially assumed away. Finally, the theory typically treats capital decisions as being perfectly divisible. In actual fact, many types of capital decisions are lumpy and the usual problems of non-convexities arise. These can probably be best dealt with on a case by case basis.

Despite these limitations, the METR is probably the best available indicator of the incentive effects of the tax structure. There are two other alternatives. The first is to measure *average* effective tax rates. The other is to do rate of return calculations on a project-specific basis. Consider the latter first. Calculating the pre- and post-tax rates of return for specific projects is a feasible thing to do and certainly gives a good indication of the proportion of a project's return that accrues to the government. As well, it might indicate for the project whether tax considerations are critical in determining the viability of the project, that is, whether taxes turn the project from having a positive present value to a negative one, or vice versa. Unfortunately, the results are not likely to be of more general applicability. The general incentive effects of a tax system depend upon how it affects marginal decisions. Marginal investment projects are difficult to identify, and it is not likely that the specific projects analyzed are

marginal. That means that at least a portion of the rate of return accruing to the government comes from infra-marginal profits. One of the great advantages of METRs is that they are designed to measure the tax rate on the marginal project.

The other alternative is to measure average effective tax rates, by which is meant the ratio of tax liabilities to capital income, where capital income is typically adjusted for inflation and true depreciation and may include both equity and interest income before taxes.[17] These will differ from METRs for a variety of reasons. Since they are average rates they will include both the tax collected on marginal projects and that collected on infra-marginal projects. They also measure taxes collected *ex post* on past investments whereas the METR is that applicable on currently undertaken marginal projects. Thus, average tax rates include windfall gains and losses resulting from unexpected changes in parameters and statutory tax rates. Average tax rates also fail to account for deferred tax liabilities resulting from temporary losses or favorable tax treatment. For these reasons, the average tax rate is not a useful measure of the incentive effects of the tax system. Typically, average effective tax rates are calculated to be higher than METRs.[18]

We proceed now to summarize the basic theory of METRs and then to consider its application to the measurement of the effect of investment incentives in developing countries.

A. Measuring Incentive Effects Using METRs

The METR is the amount of taxes collected on the marginal investment, sometimes expressed as a proportion of the rate of return on capital. In absolute terms it is defined to be the difference between the before-tax rate of return on capital r_g and the after-tax rate of return on savings r_n. The task of the investigator is to compute r_g and r_n. The measurement of r_n is conceptually straightforward since one can, in principle, observe market rates of return on savings and deduct from them the relevant taxes on savers. However, the measurement of r_g is more difficult. To observe it directly one would have to identify the marginal project and measure its rate of return. This would be impossible to do. Instead, what is done is to deduce it indirectly as follows. Using a theoretical model of investment, an expression is derived showing what the marginal product of capital would have to be in order to cover all costs (the *user cost of capital*). This is converted to a rate of return expression containing the components of cost,

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[17] Examples of these calculations may be found in Feldstein, Dicks-Mireaux and Poterba (1983) and Fullerton, King, Shoven and Whalley (1981).

[18] For example, see King and Fullerton (1984).

including taxes, that must be covered by the marginal project. This rate of return is then calculated using the various tax, depreciation and financial cost parameters facing the firm. As can be seen, this procedure is contingent on the behavioral model used to derive the user cost of capital expression of the firm. We present a simple version of that next for the case of depreciable capital incorporating a simple system of capital income taxes.

1. Deriving r_g and r_n — The Depreciable Capital Case

Much of the theory of taxation and investment has been developed in the context of depreciable capital so we begin with that case. The marginal tax rate represents the difference between the pre-tax rate of return on the marginal investment and the after-tax return to those who finance it. To derive an expression for the pre-tax rate of return, we use the conventional dynamic neo-classical theory of the firm.

Consider a firm which produces output according to the strictly concave production function $F(K_t)$ where K_t is the capital stock at time t. All other arguments are suppressed for simplicity. In the absence of new share issues, the dividend stream D_t of the firm may be written:

$$D_t = (1-u)P_tF(K_t) - (1-\phi)Q_t(\dot{K}_t + \delta K_t) + u\alpha A_t + \dot{B}_t - i(1-u)B_t \qquad (1)$$

Where

P_t = price of output

Q_t = price of investment goods

u = corporate tax rate

ϕ = investment tax credit rate

δ = depreciation rate on capital

i = nominal interest rate

A_t = undepreciated value of capital for tax purposes

B_t = debt of the firm.

This formulation makes particular assumptions about the tax structure which could easily be revised.[19]

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[19] The tax base is revenue less nominal interest (iB_t) less tax depreciation αA_t

where $A_t = e^{-\alpha t} A_0 + \int_t^{\infty} e^{\alpha(t-s)} (1 - \phi)Q_sI_s\, ds$ and $I_s = \dot{K}_t + \delta K_t$ is gross investment. The base for tax depreciation is

A "dot" over a variable indicates its time rate of change. Thus, $\dot{B}_t = dB/dt$. We work in continuous time purely for convenience, though in practice both the tax system and capital markets operate on a discrete time basis. All rates of return and tax rates are treated as constant for simplicity.

It is convenient to write (1) in the following form:

$$D_t = X_t + \dot{B}_t - i(1 - u)B_t \tag{2}$$

where X_t is called the cash flow of the firm. The latter two terms capture the financial flows of the firm with non-shareholders.

Assuming competitive capital markets, capital market equilibrium requires:

$$\rho E_t = (1-c)\dot{E}_t + (1 - \theta)D_t \tag{3}$$

where ρ is the nominal after-tax rate of return on equity to existing shareholders, E_t is the value of equity in the firm, c is the shareholders' personal tax rate on capital gains (converted to an effective rate on accruals) and θ is the shareholders' tax rate on dividends. Solving (3) for E_t gives:

$$E_t = \int_t^{\infty} e^{-\frac{\rho}{(1-c)}(s-t)} D_s \frac{(1-\theta)}{(1-c)} ds. \tag{4}$$

Thus, the equity value of the firm is the tax-adjusted dividend stream discounted by $\rho/(1 - c)$, which is the pre-tax return on equity (retained earnings) held in the firm.

The equity value defined by (4) would be a suitable objective function for the firm. However, as it stands it will not yield an internal solution. Both an investment policy $(\dot{K})$ and a financial policy $(\dot{B})$

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reduced by the investment tax credit, which is commonly the case. Other variants could be readily incorporated.

must be determined. However, as is obvious from inspection, the objective function is monotonic in B_t.[20] To avoid this problem, we treat the financial structure as exogenously given, a procedure which is common in this literature. In particular, we assume that the debt-equity ratio is given as $b = B/E_t$.[21] Using this definition of b in (2), substituting the result in (3) and again solving for (4) yields:

$$E_t = \left(b + \frac{(1 - c)}{(1 - \theta)}\right)^{-1} \int_t^{\infty} e^{-r(s - t)} X_s ds \tag{5}$$

where

$$r = \frac{\frac{\rho}{(1 - c)} + i(1 - u)B\frac{(1 - \theta)}{1 - c)}}{1 + b\frac{(1 - \theta)}{(1 - c)}} \tag{6}$$

We can think of r as the nominal cost of financial capital to the firm. It is a weighted average of the cost of equity finance $(\rho/(1-c))$ and the cost of debt finance $(i(1-u))$. Furthermore, the weights can be shown to be the proportions in which additional investment is financed by new debt and retained earnings.[22]

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[20] The financial part of the objective function may be written: $\int_t^{\infty} e^{-\frac{\rho}{(1 - c)}(s - t)} \left(\dot{B}_s - i(1 - u)B_s\right)\frac{(1 - \theta)}{(1 - c)} ds$

[21] This procedure of assuming that a firm's optimization can be treated as a two-stage problem with the first stage representing the choice of a financial structure and the second stage a real capital structure can be justified under certain restrictive assumptions. For example, if the firm's costs of debt and/or equity capital are increasing functions of the debt-equity ratio, that will be the case. (This is demonstrated analytically in Boadway (1987).) It will also be true if the firm is quantity constrained in debt, or if the financial structure of the firm is determined by its cash flow according to the "pecking order" of costs of various sorts of finance.

[22] From the capital market equilibrium condition (3), for a given value of E_t, reducing current dividends by \$1 causes share values to rise by $\frac{(1 - \theta)}{(1 - c)}$ dollars. Therefore, increasing retained earnings by $(1 - \beta)$ will cause the value of equity to rise by $(1 - \beta)\frac{(1 - \theta)}{(1 - C)}$. The fixed debt-equity ratio requires that $B = bE$. Therefore, to keep b fixed, the debt increase β accompanying the increase in retained earnings is given by $\beta = b(1 - \beta)\frac{(1 - \theta)}{(1 - c)}$. Solving this expression for β gives

The incorporation of new issues as a source of equity finance can readily be done. The nominal cost of new equity finance can be shown to equal $\frac{\sigma}{(1-\theta)} + \pi\left(1 - \frac{(1-c)}{(1-\theta)}\right)$ where σ is the required return to new shareholders.[23] If a proportion α of equity finance is from retained earnings, the cost of capital can be written as:

$$r = \beta i(1 - u) + (1 - \beta)\left[a\frac{\rho}{(1-c)} + (1-a)\left(\frac{\sigma}{(1 - \theta)} + \pi\left(1 - \frac{(1-c)}{(1-\theta)}\right)\right)\right] \tag{7}$$

where $\beta = \frac{b(1-\theta)(1-c)}{1+b\frac{(1-\theta)}{(1-c)}}$ is the proportion of new investment which is debt-financed.

By (5), the equity value of the firm is proportional to the present value of the cash flow discounted by the cost of capital r. If we take this latter to be the objective function of the firm, the first-order condition on the real investment decision of the firm can be shown to equal:[24]

$$\frac{PF'(K)}{Q} = \frac{r + \delta - \dot{Q}/Q}{1 - u}(1 - \phi)\left(1 - \frac{u\alpha}{r + \alpha}\right) \tag{8}$$

$\beta = \frac{b(1 - \theta)/(1 - c)}{1 + b(1 - \theta)/(1 - c)}$ as in the text.

[23] The logic behind this is as follows. Treat (4) as referring to value per share. Let $d = De^{-\pi t}$ be the flow of real dividends per share. If d were constant over time, integration of (4) would yield $E = d\frac{(1 - \theta)/(1 - c)}{(\sigma/(1 - c) - \pi)}$. For generality we allow the required rate of return to new equity owners σ to differ from existing shareholders ρ. From the point of view of new equity owners the analogous expression for the value per share would be $E = d\frac{(1 - \theta)/(1 - c)}{(\sigma/(1 - c) - \pi)}$. Consider now a new share issue of $1. In itself, this will cause the value of existing equity to fall by $1. Using the above expression for E, a change in E of $1 is equivalent to a change in the perpetual flow of dividends of $d = \frac{\sigma}{(1 - \theta)} - \pi\frac{(1 - c)}{(1 - \theta)}$. This is the flow cost to existing shareholders of raising one dollar of new equity. See also Auerbach (1979).

[24] The actual problem of the firm is:

$$\underset{K,A}{Max} \int_0^\infty e^{-rt}\left[P_t F(K_t)(1 - u) - (1 - \phi)Q_t(\dot{K}_t + \delta K_t) + u\alpha A_t\right]dt$$

$$s.t.\ \dot{A}_t + \alpha A_t = (1 - \phi)Q_t(\dot{K}_t + \delta K_t)$$

where time subscripts have been suppressed for simplicity. Next, denoting p and q as real prices obtained by deflating P and Q by $e^{-\pi t}$ where π is the inflation rate, (8) becomes:

$$\frac{pF'(K)}{q} = \frac{r - \pi + \delta - \dot{q}/q}{1 - u}(1-\phi)\left(1 - \frac{u\alpha}{r + \alpha}\right) \tag{9}$$

This is a standard user cost of capital expression incorporating taxes. It represents the gross-of-tax marginal product of capital. To convert it to a rate of return we subtract the economic depreciation rate. The gross rate of return r_g is defined as:

$$r_g = \frac{r - \pi + \delta - \dot{q}/q}{1 - u}(1-\phi)\left(1 - \frac{u\alpha}{r + \alpha}\right) - (\delta - \dot{q}/q) \tag{10}$$

The measurement of r_g (i.e., the components of its right-hand side) is an essential ingredient of the marginal effective tax calculation. The definition of the marginal effective tax rate is simply $t = r_g - r_n$ where r_n is the real after-tax rate of return to savers. In the context of this model, r_n is given by:

$$r_n = \beta i(1 - m) + (1 - \beta)(a\rho + (1 - a)\sigma) - \pi \tag{11}$$

where m is the personal tax rate on interest income. Equations (10) and (11) form the basis for measuring marginal tax rates, the details of which we return to below.

This basic formulation has made a number of rather restrictive assumptions. Before turning to other sorts of capital decisions, it is worth considering the implications of relaxing some of them.

2. *The Implications of Relaxing Some Assumptions*

a. Non-exponential depreciation

Neither the rate of real depreciation nor the rate of tax depreciation need be exponential. We could define a depreciation function $\Delta(K)$, for example, such that $I = \dot{K} + \Delta(K)$. In this case, the term δ in (9) and (10) would be replaced by $\Delta'(K)$. Similarly, vintage capital could also be incorporated. The

tax depreciation rate could take on any arbitrary pattern as well. The term $u\alpha/(r + \alpha)$ is the present value of the tax savings from future depreciation deductions when an exponential depreciation schedule is used. For other depreciation schemes, this would simply be replaced with the appropriate present value expression.[25]

More generally, it is convenient to write r_g in a slightly more concise way. Define Z as the present value of the future tax savings from depreciation allowances per dollar of gross investment. Then, r_g may be written:

$$r_g = \frac{r + \delta - \dot{q}/q - \pi}{1 - u}(1 - \phi)(1 - Z) - (\delta - \dot{q}/q) \qquad (10')$$

Note that (10') could be obtained from the following simplified maximization problem for the firm:

$$\underset{\dot{K}}{\text{Max}} \int_0^\infty e^{-\pi t}\left[P_t F(K_t)(1 - u) - (1 - \phi)(1 - Z)Q_t(\dot{K}_t + \delta K_t)\right]dt$$

The term $(1 - \phi)(1 - Z)$ can be interpreted as the *effective* purchase price of capital goods taking account of the tax saving due to the investment tax credit and future depreciation deductions.

b. Time-varying tax parameters

For some of the tax incentives we are interested in, the firm will face a set of tax provisions that vary over time. The simplest case of this is the tax holiday, but other temporary tax provisions are similar in that regard. As well, tax parameters may vary because the status of the firm changes over time. For example, the firm may change from having negative to positive taxable income. For illustrative purposes we consider the tax holiday case. Define the *effective statutory corporate tax rate* of the firm to be u_t at time t. This may also be the actual statutory tax rate and will be elaborated on further below. The firm's after-tax net revenue at time t is then $P_t F(K_t)(1 - u_t)$. The after-tax net cost

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[25] For example, indexing the book value of capital for depreciation would change the present value expression to $u\alpha/(r + \alpha - \pi)$. Alternatively, straightline depreciation over a length of life T would give a present value of tax savings of $u(1 - e^{-rT})/rT$.

of investment to the firm is $Q_t I_t(1 - Z_t)$, where Z_t is the present value at time t of future tax depreciation allowances per dollar of gross investment. For simplicity, we exclude the investment tax credit, although it could easily be added.

The representative firm maximizes the present value of its after-tax cash flow. Following the above simplification, its problem can be formulated as follows:

$$\underset{\dot{K}}{Max} \int_0^{\infty} R_t \left[P_t F(K_t)(1 - u_t) - (1 - Z_t) Q_t (\dot{K}_t + \delta K_t) \right] dt$$

where R_t is the nominal discount factor in period t and satisfies $\dot{R}_t / R_t = -r_t$. Here r_t is the nominal after-tax cost of finance to the firm at time t defined as above to be a weighted average of the cost of debt and the rate of return on equity.

The solution of this problem yields a set of conditions characterizing the long run profit-maximizing choice of K_t at each point of time:

$$\frac{P_t F'(K_t)}{Q_t} = \frac{r_t + \delta - \dot{Q}_t / Q_t}{1 - u_t} (1 - Z_t) + \frac{\dot{Z}_t}{1 - u_t} \tag{12}$$

The last term involving the change in Z_t reflects the fact that an additional cost of holding an incremental dollar of capital is the fact that postponing the purchase of capital will increase future tax savings by $\dot{z}_t$ (which could be positive or negative). Using this expression, r_g becomes:

$$r_g = \frac{r_t - \pi + \delta - \dot{q}_t / q_t}{1 - u_t} (1 - Z_t) + \frac{\dot{Z}_t}{1 - u_t} - \delta + \frac{\dot{q}_t}{q_t} \tag{13}$$

To apply this expression to particular cases, we need to specify the path of u_t, r_t, and Z_t. Consider the case in which the firm operates under a tax holiday for the time period $O \cdots H$. No taxes are paid by the firm over the tax holiday period. Also, suppose that, as in some countries (e.g., Malaysia until 1988), depreciation allowances can be delayed until the end of the tax holiday. At that time, all accumulated tax savings from annual depreciation allowances could be set off against revenues

earned by the firm in the first tax year following the tax holiday period. Assume that the profits of the firm at the time immediately following the tax holiday are sufficiently large to absorb all depreciation allowances that have accumulated over the tax holiday period. Should the firm decide to distribute its profit during the holiday period, the dividends received by its shareholders are also exempted from personal income taxes.

These features of the treatment of tax holiday firms make the computation of the before-tax rate of return on investment complicated. The tax holiday provisions make Z_t, r_t and u_t all vary over time. Consider the computation of u_t, r_t and Z_t in turn.[26] The effective statutory corporate tax u_t to the firm over the tax holiday period is zero since the firm is completely exempt from paying any tax on its income. However, the corporate tax rate will revert to the standard rate u after the tax holiday. Therefore,

$$u_t = \begin{cases} 0 \text{ for } 0 \le t \le H \\ u \text{ for } t \ge H \end{cases} \tag{14}$$

The cost of finance to the firm is given by:

$$r_t = \beta i(1 - u_t) + (1 - \beta)\rho \tag{15}$$

where we have neglected new equity issues and we treat the parameters β, i and ρ as fixed. The cost of funds to the firm will differ between the taxable and tax holiday firms because of the differences in u_t.

The calculation of the present value of tax savings due to depreciation Z_t must take into account the carryforward from the tax holiday to the taxpaying period of accumulated depreciation expenses as well as the variable discount rate. The value of Z_t will vary depending upon when the investment is undertaken. For investments made during the tax holiday period, Z_t will be given by:

$$Z_t = (R_H - R_t)\left(\int_t^H uae^{-\alpha(s-t)}\,ds + \int_H^\infty uae^{-(r+\alpha)(s-H)}ds\right) \tag{16}$$

For t > H, the expression for Z_t is the same as in equation (9) above. Note that Z_t is a monotonically increasing function with respect to time t within the pioneer period. Using equations (14), (15) and (16) along with (13), the time profile of the before-tax rate of return on capital $r_g(t)$ for a pioneer firm can

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[26] This computation is adopted from Boadway, Chua and Flatters (1989).

be easily calculated. It will vary over the tax holiday period and will become constant after the transition to full taxpaying status. Below we provide some sample calculations for this tax holiday case.

c. Monopoly behavior

If the firm is a monopolist, the left-hand side of (8) becomes the marginal revenue product per unit of capital, $(P + P^1F(K))F^1/Q$, or $(1-1/\eta)PF'/Q$ where η is the elasticity of demand. Calculating the marginal distortion using (10) would capture only the tax distortion, the difference between the private gross rate of return and the net return to savings. The social gross rate of return would have to include the monopoly distortion and would be given by:

$$r_g = \frac{r+\delta-\dot{q}/q-\pi}{(1-1/\eta)(1-u)}(1-\phi)\left(1-\frac{u\alpha}{r+\alpha}\right)-(\delta-\dot{q}/q). \qquad (17)$$

Monopsony power in the purchase of capital inputs is a special case of adjustment costs to which we turn next.

d. Adjustment costs

The implication of adjustment costs for measuring the marginal tax rate depends upon the form of the adjustment costs and upon the extent to which they are tax deductible. Consider as an example the case in which adjustment costs are separable and are given by the function $\gamma(\dot{K},K)$. We denote by γ_i the derivative of the adjustment cost function with respect to its ith argument. If a proportion x of adjustment costs are tax-deductible, the objective function of the firm must include as part of the cash flow the term $-(1-xu)\gamma(\dot{K},K)$. The first-order conditions then simplify to:

$$\frac{PF'(K)}{Q} - \frac{1-xu}{1-u}\frac{(\gamma 2+r\gamma 1-\dot{\gamma}1)}{Q} = \frac{r+\delta-\dot{Q}/Q}{1-u}(1-\phi)\left(1-\frac{u\alpha}{r+\alpha}\right). \qquad (18)$$

The left-hand side represents the gross marginal product of capital after adjustment costs. If adjustment costs were independent of tax, the procedure suggested above for measuring r_g would appropriately capture the social rate of return after adjustment costs. A sufficient condition for this would be that $x = 1$ (so adjustment costa are tax-deductible) and ra is independent of taxes. Failing this, the proper measurement of r_g would require terms involving the adjustment cost function which is not observable. In practice, we are typically able only to measure r_g without accounting specifically for adjustment costs. To that extent, the METR will inaccurately neglect the interaction of the tax system with adjustment costs and would only given an approximate measure of the full distortion due to the tax.

Auerbach (1990) argues that the usual assumption of instantaneous capital stock adjustment is quire restrictive as the firms attempt to dampen the swings in capital stock due to changes in the rental price of capital. Thus, a forward-looking investment behavior would depend upon the weighted-average of current and future costs of capital, taking into account the adjustment costs of additional investment. He suggests that the introduction of time-variant tax parameters and convex adjustment costs would be consistent with such behavior. This can be accomplished by introducing an adjustment cost parameter in the marginal cost of capital goods to capture increase in effective capital goods prices to the firm per unit of additional investment.

3. METRs for Other Investment Decisions

In principle, an effective tax rate could be derived and measured for any sort of decision for which taxes impinge at the margin. We present below the derivation of r_g for three different cases -- non-depreciable capital and depletable resource properties. Other interesting cases which could be worked out include research and development, investment and harvesting of renewable resources, labor training, advertising and marketing, etc. IN each case what would be involved is a derivation of r_g which, in turn, requires a theory about the way the capital decision in question is determined. The computation of an effective tax rate as $t=r_g - r_n$ is as before.

a. Non-depreciable capital

The rate of return on non-depreciable capital (e.g. land) is simple the special case of depreciable capital where $\delta = \alpha = 0$. Thus (10) reduces to:

$$r_g = \frac{r - \dot{q}/q - \pi}{1-u}(1-\phi) + \dot{q}/q. \tag{19}$$

Recall the taxes generally influence r as in (7). In general taxes will have an ambiguous effect on r_g. In the absence of inflation and the investment tax credit (π, ϕ = 0), r_g would be higher than in the absence of taxation because only part of the cost of holding the land would be tax-deductible (i.e., the interest cost). However, the ability to deduct nominal interests costs when inflation is present and the ability to claim an investment tax credit would both reduce the effective tax rate.

b. Inventory capital

A completely general theory of the holding of inventories can be very complicated indeed owing to the dynamic nature of the problem. We make some reasonable simplifications to make the problem both manageable and intuitive. In particular, we model the firm in the steady state.[27] The firm produces an output X using as an some raw material. An amount R of the raw material is held as inventory (or work in progress). The average holding period of a unit of inventory is T = R/X, chosen by the firm. The firm produces a unit of output using a unit of raw material drawn from inventory and incurs cost of C (X, R) where $C_1 > 0$, $C_2 < 0$. The price of output is Q and the purchase price of raw materials P.

The corporate tax base includes total revenues (QX) less current costs (C) less interest costs less the First-In-First-Out (FIFO) value of raw materials taken out of inventory.[28] We denote P_{-T} as the FIFO value of goods taken out of inventory after being held there a length of time T. The problem of the firm at time zero is:

$$\underset{X,\dot{R}}{\text{Max}} \int_0^{\infty} e^{-\pi}\left((1-u)(QX - C(X,R)) - P(X+\dot{R}) + uP_{-T}X\right)dt \tag{20}$$

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[27]The following analysis is adopted from Boadway, Bruce and Mintz (1982). It might be noted that from an analytical point of view, the treatment of renewable resources would be similar to that of inventories.

[28]We analyze the case of FIFO tax accounting for illustrative purposes. Some countries (e.g. the United States) allow firms to use LIFO accounting for taxes.

where $T=R/X$ and $P(X+\dot{R})$ represents the new acquisition of raw materials. The first order conditions for this problem reduce to

$$\frac{-C_2(X,R)}{P} = \frac{r-(1-ue^{-\gamma T})\gamma}{1-u} \tag{21}$$

where $\gamma=\dot{P}/P$, the rate of change in the nominal price of the good held as inventory. This expression gives the marginal benefit of a unit of inventory holdings. To convert it to a rate of return, we subtract the real capital loss on holding a unit of inventory (which is the analog of true depreciation here), so:

$$r_g = \frac{r-(1-ue^{-\gamma T})\gamma}{1-u} + \frac{\dot{P}}{P} \tag{22}$$

where $\dot{p}/p=\dot{P}/P-\pi$, the rate of change in the price of inventory relative to that of other goods in the economy.

c. Depletable resources

We with inventories, we must make some simplifying assumption to render the problem of exploiting non-renewable resources manageable. We consider a firm which is simultaneously involved in exploration, investment in mining facilities, and extraction. Inventories are excluded so that sales equal extraction; it would be relatively straightforward to add inventories. The taxation of resources is notoriously complex in practice. For illustrative purposes we consider a relatively simple scheme which incorporates most of the key issues.[29]

In the exploration state the firm hires current inputs L at a price W and produces a depletable asset according to the strictly concave production function S(L). It then invests in mining capital K at a price Q to make the asset ready for extraction. The production function is Z(K, F) where F is the current use of the previously discovered asset. This is the only state at which depreciable capital is used, though it would be straightforward to allow for it at either of the other two states. Finally, the firm extracts an amount Y of the resource according to the strictly convex nominal cost function C(Y) and sells it at a price P. The dividend flow resulting from this three-stage process is:

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[29]The following analysis is adopted from Boadway, Bruce, McKenzie and Mintz (1987).

$$D = PY - C(Y) - WL - Q(\dot{K} + \delta K) + \dot{B} - iB - T \tag{23}$$

where T is the tax liability.

The expression for tax liabilities can vary widely from jurisdiction to jurisdiction and from one resource to another. Typically, firms will be liable both for a special resource tax and for a corporate tax. We assume the resource tax is of the form of a severance tax (or loyalty) based on the output produced. The corporate tax generally involves generous write-off provisions as well as some deduction or for the use of the asset itself (a depletion allowance). We assume a severance tax rate of g based on total revenues. The corporate tax liability will be written:

$$T_c = u[PY - C(Y) - WL - \alpha A - R - iB] + \phi Q(\dot{K} + \delta K). \tag{24}$$

Here, R is the depletion allowance and is defined to be R = t (PY - C (Y) - αA), though most tax systems are more complicated than that. All other variables in (24) are the same as defined earlier.

Proceeding as before, using the expression for taxes and the severance rate, we define the case flow of the firm to be:

$$\begin{aligned} X = {} & PY(1-u(1-t)-g) - C(Y)(1-u(1-t)) - WL(1-u) \\ & -Q(1-\phi)(\dot{K}+\delta K) + \alpha Au(1-t). \end{aligned} \tag{25}$$

The firm maximizes the present value of its cash flow discounted by r as in (7) and subject to the equation of motion on A and the following two resource constraints:

$$\begin{aligned} \int_0^\infty (Y - Z(F,K))dt \le 0 \\ \int_0^\infty (F - S(L)dt \le 0. \end{aligned} \tag{26}$$

The first states that the total resource extracted cannot exceed the total developed, while the second states that the total resource developed cannot exceed the total found. In a more general version of this problem, this constraint would have to hold at each point in time.

The first order conditions for this problem on $\dot{K}$,L and Y respectively reduce to:

$$\frac{p-c'}{q}\frac{\partial Z}{\partial K} = \frac{(r-\pi+\delta-\dot{q}/q)}{1-u(1-t)-gp/(p'-c')}(1-\phi)\left(1-\frac{\alpha u(1-t)}{r+\alpha}\right) \tag{27}$$

$$\frac{(p-c')}{w}\frac{\partial Z}{\partial F}\frac{\partial S}{\partial L} = \frac{1-u}{1-u(1-t)-gp/(p-c')} \tag{28}$$

$$\frac{\dot{p}-\dot{c}'}{p-c'} = r-\pi+\frac{\dot{P}}{p}-\frac{(r-\pi)g}{(1-u(1-t))(1-(c'/p))} \tag{29}$$

The first of these is simply the before-tax gross marginal product of capital. To convert it to r_g, subtract $\delta - \dot{q}/q$ as before. The second equation is the social value of marginal product per unit of input L. An effective tax rate can be obtained directly by subtracting unity from (28). The final equation is a form of Hotelling's rule. It gives the gross rate of return to society from not extracting the resource. It can be converted to an effective tax wedge by subtracting r_n.

3. *Some Issues in Applying METRs*

Effective tax rate computations are based on calculating values for r_n as given by (11) and r_g as given by (10) or its analog for other sorts of capital. The procedure typically followed is to attempt to evaluate all the parameters in, say, equations (10) and (11) for some level of aggregation and for some assumed values for the various parameters. Before outlining the method used to obtain parameter values, it is worth mentioning some important conceptual issues and assumptions used as well as their limitations.

a. *The level of aggregation*

Given the specificity of most tax structures, there are in principle a large number of marginal distortions on investment in the economy. Some aggregation is inevitable. On the asset side, the minimum amount of disaggregation often used is by type of asset (machinery, building, land, inventory, and depletable assets). Beyond that, METRs may be variously disaggregated by industry, by size of firm, by location (e.g., province or region), and by year. On the financing side, some disaggregation may be done by type of asset holder, for example, income class, tax status, type of financial institution, etc.

There are two alternative procedures for obtaining aggregate effe' ' e tax rates from data which are available at varying degrees of disaggregation. One procedure, follow ' ng by King and Fullerton (1984), is to calculate effective tax rates at the lower levels of aggregation and aggregate the METRs up by some weighting procedure. The other is to aggregate the underlying parameters up first and then calculate the aggregate METR at the higher level of aggregation. This is the procedure followed by Boadway, Bruce and Mintz (1984).

b. The arbitrage assumption

A key distinguishing feature of alternative effective tax calculations concerns which arbitrate assumption is chosen and consequently which rates of return are taken as given. The need for an arbitrate assumption arises because of the fact that tax systems impose varying burdens on different sources of finance -- debt, retained earnings and new issues. This implies that differential burdens must be imposed on some agents in capital markets. The arbitrate assumption stipulates which agents in the market are able to compete away differential tax burdens. We outline four arbitrate assumptions that have been used in the literature.

King and Fullerton (1984) adopt two alternative arbitrage assumptions and present the results of each in their inter-country comparisons. They are the so-called fixed-p and fixed-s cases. Their fixed-p assumption involves comparing projects with the same before-tax rate of return. This is analogous to assuming r_g is the same on all projects (and = 10% in their calculations). Given the characteristics of the tax system, one can then work backwards and compute for each firm the cost of funds r and also the after-tax return to savers i, ρ and σ. Notice that this implies that different firms face different interest rates and rates of return on equity. Thus, the fixed-p assumption cannot correspond with market equilibrium. Therefore, it cannot succeed in picking out those investments which are truly marginal in a given economy. It does measure the effective tax rate across similar projects in different circumstances. However, those different circumstances involve both different tax systems and different costs of finance.

Their fixed-s case is that in which all arbitrate occurs at the household level so that, in our notation, $i(1-m) = \rho = \sigma$. Households in different tax brackets can still face different after-tax returns, but for any asset the return is the same to a given household. Starting with given values of the after-tax return to households (King and Fullerton assume 5%), the cost of funds to firms can be calculated. Under the fixed-s assumption, firms will face different costs of all three sources of finance.

The fixed-p assumption could probably not be described as an arbitrage assumption since all agents are receiving different returns from the same assets. As well, the fixed-p assumption does not

represent a market equilibrium, as mentioned above. A variant of the fixed-p case was used by Bradford and Fullerton (1981) who assumed that arbitrate occurred at the firm level. This implies that the firm faces the same cost of finance from all sources, so:

$$i(1-u) = \frac{\rho}{(1-c)} = \frac{\sigma}{(1-\theta)} + \pi\left(1 - \frac{(1-c)}{(1-\theta)}\right)$$

Given the cost of funds to the firm, the rate of return received by savers in various assets, and thus r_n, can be calculated.

The fourth arbitrate assumption is that used by Boadway, Bruce and Mintz (1984). It is referred to as the *open economy assumption* and seems particularly appropriate for the case of developing countries. The basic assumption is that the cost of debt and equity finance facing a country are determined by international capital markets. More particularly, for debt and after-tax return to foreign debt-holders is given exogenously. If starred refer to foreign ones, the following international arbitrate conditions must hold:

$$(i+\pi)(1-m^*) - (1-c^*)(\pi-\pi^*) = (i^*+\pi^*)(1-m^*). \qquad (30)$$

This arbitrate equation, which determines i, assumes that exchange rate movements reflect differences in expected inflation (and are taxed as capital gains).

On the equity financing side, a further assumption is made for data reasons. The rate of return on equity is calculated from observed stock market data in a manner which does not allow one to distinguish the rate of return on retained earnings from that on new share issues. The rate of return on equity paid by firms is therefore assumed to be the same for both. Denoting it by ρ_s, it is given by:

$$\rho_s = \frac{\rho}{1-c} = \frac{\sigma}{1-\theta} + \pi\left(1 - \frac{1-c}{1-\theta}\right). \qquad (31)$$

The value of ρ_s must satisfy an international arbitrage condition analogous to (30) with ρ_s replacing i. The net return received by household savers, ρ and σ, can then be computed from (31) and used to obtain r_n. The value of r paid by firms is simply:

$$r=\beta i(1-u)+(1-\beta)\rho_g. \qquad (32)$$

Thus, given observed measures of i and ρ_g, all financial rate of return variables can be computed.

Also comparative static or counterfactual computations can be done by considering changes in tax or inflation rates domestically given that the right-hand side of (30) is exogenous.

One advantage of the open economy arbitrate assumption is that it allows us to disaggregate METR calculations into that due to the corporate tax and that due to the personal tax. In an open economy facing fixed world rates of return, corporate taxation effects mainly the investment decision while personal taxes affect savings. The magnitudes of the relevant distortions can be obtained by taking the difference between the world cost of funds r^* and either r_g or r_n as appropriate, where $r^* = \beta i + (1-\beta)\rho - \pi$.

c. *Loss offsetting and risk*

The above formulations were based on two implicit assumptions. The first is that negative tax liabilities are treated symmetrically with positive ones. The other is that the analysis is based on a deterministic model of household choice.

The absence of full loss offsetting can, in principle, be incorporated into the above theory. In theory, its effect can either increase or decrease marginal tax rates, though the former seems most likely to occur. In the context of depreciable assets, the absence of full loss offsetting reduces the present value of depreciation write-offs and the investment tax credit $(u\alpha/(r+\alpha),\phi)$ and reduces the value of interest write-offs ui (thereby increasing the effective cost of debt finance). Both these increase r_g to the extent that depreciation or interest write-offs are postponed. On the other hand, to the extent that revenues are earned while the firm is in a non-taxpaying position, r_g will fall (since the grossing-up of the user cost in (10) will be at a rate greater than (1-u)). The methodology for taking these difference into account is similar to that presented above for the tax holiday firm.

The incorporation of risk is somewhat more difficult. One simple way to think of the way affects r_g is through its effect on the rate of return to equity, ρ (or σ). One can think of the return to equity ρ as comprising a safe return i* plus a risk premium h which can be estimated under certain circumstances. It has been established in the literature (e.g.Mintz (1982), Gordon (1985)) that full loss offsetting is

equivalent to allowing a deduction for the cost of risk-taking. To the extent that loss offsetting of risks does occur, the risk premium itself ought to be reduced by the tax, $h(1-u)$. Since our methodology does not reduce the risk premium by the tax, it will yield an overestimate of r_g to the extent that loss offsetting of risk occurs.

Whether or not loss offsetting occurs depends on the source of the risk. If the risk takes the form of capital risk as discussed in Bulow and Summers (1984), loss offsetting does not occur. On the other hand, risks reflected in varying revenues will almost certainly be partly offset.

Risk can also take the form of uncertainty about future government policy, i.e.,policy risk. Auerbach (1990) underlines the importance of the credibility of tax regime for the effectiveness of tax policies. If an announced tax policy change is seen as a temporary change only and likely to be reversed, it will not have the same effect as a possibly less stimulative alternative but one which is seen as permanent. Also with an uncertain tax climate, investors are likely to demand higher expected return from investments.

d. The data

We briefly outline here the manner in which numbers can be attached to the variables in r_g and r_n. The exact manner in which data are obtained depends upon the level for aggregation at which effective tax rates are being computed. Nonetheless the same general approach can be followed in all cases. The following summarizes the principle followed in constructing the various types of data.

(i) Financing Ratios (β,a). King and Fullerton calculate effective tax rates separately for different sources of finance so they do not really need to use financing ratios. However, some studies have incorporated financial ratios for different types of firms as an element of their calculations thus picking up the way in which the interest deductibility provision benefits some types of firms more than others. These can be constructed using the structure of liabilities from published balance sheets. Depending on the application, either differences between end-of-year values of liabilities of debt, retained earnings and new issues, or the stock values themselves can be used to estimate ß and a.

(ii) Rates of Return (i,ρ,σ). As mentioned, King and Fullerton simply present their effective tax rates for arbitrary financial rates of return. Alternatively, one can try and measure the actual effective tax rates for a given year by using observed financial data. The bond rate i can be obtained using long-term nominal corporate bond yields. The required return on equity before personal tax can be calculated

from the inverse of price-earnings ratios, where book earnings are corrected to account for inflation's effects on the capital stock, inventories and debt liabilities. The arbitrage assumption requires that this also equal the before-tax return on new issues. For calculations at the industry level, an industry-specific risk premium can be calculated from capital-asset pricing model studies and adjusted for leverage.

(iii) Inflation Rate (π). Again, King and Fullerton simply assume a given rate of inflation. Alternatively, the expected inflation rate can be estimated using an ARIMA forecast based on the consumers price index as in Boadway, Bruce and Mintz(1984).

(iv) Real Capital Gains ($\dot{q}/q, \dot{p}/p$). Expected capital gains on capital goods and resources can, in principle, be estimated by the same source procedure as for inflation, using the appropriate capital good series or resource price index. For resources subject to royalties, it is also necessary to know the profit margin $(p-c')/p$. These can be calculated by using estimates of the short run cost function. In most applications, real capital gains have simply been ignored since their estimates are regarded as not being reliable.

(v) Depreciation Rate (δ). Depreciation rate calculations are typically based upon length of life data for various types of capital. Where necessary, service lives can be aggregated using as weights the proportions of gross investment. Service lives L can be converted to equivalent exponential depreciation rates by the formula $\delta=2/L$. See Hulten and Wykoff (1981).

(vi) Holding Period for Inventories (T). These can be calculated from the ratio of average monthly inventories to average monthly shipments.

(vii) Corporate Tax Parameters (α, u, ϕ). In most countries, the corporate tax rate and the investment tax credit rates depend upon the type and size of industry, and the type of investment. For each type of capital good, statutory tax rates can be aggregated appropriately according to the share of income taxable at various rates. A similar procedure can be used for the investment tax credit. For depreciation rates, when the tax system allows declining balance write-offs, α can be calculated as an average of the rates applicable to various types of capital using as weights the amounts of gross

investment. When straight-line depreciation is allowed, the expression for r_g has to be amended as indicated earlier.

(viii) Personal Tax Returns (m, θ, c). Typically, very little disaggregation occurs on the saving side. The personal tax rate on interest income is calculated as an average of marginal tax rates on capital income across all income classes. In the case of dividends, this must be corrected for any dividend tax credit that exists. The capital gains tax rate is somewhat more difficult to calculate since c is an accrued tax rate whereas capital gains are actually taxed on realization. The accrued tax rate c is calculated such that the present value of capital gains tax payment based on realized taxation is equal to the present value of taxes levied on accrued gains discounted by the shareholders' after-tax cost of equity finance. The average holding period of shares can be taken as the ratio of shares floated to volume of shares traded. The realized capital gains tax rate itself may differ from the personal tax rate on other forms of capital income.

B. Using METRs to Evaluate Investment Incentives

In principle, it should be relatively straightforward to use the METR methodology to determine the size of incentive offered by various types of measure design to encourage investment. Once can calculate the METR in the presence and the absence of incentives and see explicitly by how much the incentive changes the marginal tax rate on investment decisions of various sorts. As mentioned there are limitations to using METRs and they apply equally well here. For one thing, there will be a large number of potential METRs corresponding with the many types of capital decisions undertaken by the many different agents in the economy. Most METR studies show considerable dispersion of rates across the economy. The same incentive can have very different effects on different types of investment decisions. Thus, it is difficult to characterize the effects of investment incentives in a simple and general way. Instead, one may be left with presenting a series of essentially illustrative calculations of the effects of investment incentives in different circumstances. It is naturally quite important for evaluative purposes to select the appropriate sample calculations for illustrating the effects of incentives.

For another thing, the information content of METR effects is limited. While it shows the size of the incentive imposed at the margin on a particular sort of investment decision, it does not show the magnitude of response of investment to the incentive. Nor does it show the tax revenue effects to the

government. This means that, while METR calculations will be useful for analyzing tax reform issues, they will be less so for the positive analysis of the effect of incentives on economic activity.

The use of the METR methodology for illustrating the effect of investment incentives can be illustrated by some sample calculations. Below we report on a selection of effective tax rate calculations designed to illustrate a number of different effects. Before doing so , it is worth discussing some of the key dimensions of the effect of investment incentives that are likely to be of interest in evaluating them. These will influence the sorts of METR calculations that are most worth doing.

1. Comparative effects of alternative instruments

Different ways of encouraging investment can have very different impacts on the incentive to invest depending on the circumstances. Indeed, some measures which on the surface might appear to provide incentives to invest may actually do the opposite. This can be illustrated by some examples. Consider first measures involving reductions in tax rates, either permanently or temporarily. The effect of this on investment incentives to a great extent on the sign of METR. This can be either positive or negative depending on the generosity of deductions and credits for capital costs. A result that has been established in the literature is that, in the absence of investment tax credits, a corporate income tax will be neutral if the present value of deductions for capital costs(i.e., interest and depreciation) just equal the initial cost of capital.[30] If the present value of deductions exceeds the initial capital cost, the METR is negative, and vice versa. In these circumstances, a reduction in the statutory tax rate will typically reduce the absolute value of the METR, but will not change its sign.[31] Thus, if the effective tax rate is negative to start with, reductions in tax rate will make it less negative, thereby reducing the incentive that already exists for investment.

This ambiguous effect of tax rate reductions arises because of the fact that the tax rate applies both to deductions and to revenues. Measures which apply only on the deduction side would be expected to have unambiguous effects on the direction of change in incentive to invest. These would include investment tax credits, accelerated depreciation, enhanced deductions for the cost of finance, and the like.

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[30]This is originally due to Smith (1963), but is discussed more fully in Stiglitz (1973) and Broadway and Bruce (1984). It can be generalized to include investment tax credits.

[31]We say "typically" because r_g is non-linear in the tax rate u and in some circumstances the effect can go the other way. A reduction in u will increase the cost of funds r and reduce the present value of tax saving from depreciation Z, but will also reduce the taxation of revenues. The outcome of these opposing tendencies might be expected usually to be to reduce METR, but need not always do so.

2. The absence of full loss offsetting

Most tax systems allow only partial offsetting of losses. Losses can usually be carried forward for a specified period of time, and perhaps backward also. In these circumstances, the effect of various investment incentives will depend upon the tax status of the firm and upon the nature of the tax incentive. A distinction might be drawn here between three different types of investment incentives. One is a tax rate reduction as already discussed. Another is an incentive which changes the timing but not the magnitude of deductions, such as accelerated depreciation. The third is an incentive which increases the amount of deduction, such as investment tax credit. These three types of incentives can have quite different relative effects on taxpaying and non-taxpaying firms.

For example, temporary tax reductions(e.g., tax holidays) will have very little, if any, effect on the incentive to invest for a firm in a tax loss position. Since the firm is not taxpaying when the tax reduction is in effect, the tax rate is essentially irrelevant. The exception to this is if the tax holiday is accompanied by some measures which allow for the selective carryforward of some capital cost. For example, if depreciation deductions are elective, as they are in some tax systems, the firm can choose not to take them until the end of the tax holiday period. In this way, they can have an incentive effect on investment.

Similarly, measures which essentially accelerate the timing of a given stream of deductions will have minimal impact if they accelerate them into periods when the firm is non-taxable. In this case, the firm cannot take advantage of the acceleration and at best simply carries forward the deduction into taxable periods later on. Incentives which increase the total amount of write-off will continue to provide increased benefit to the investing firm, though not at the same level as if there were full loss offsetting. If the incentives like the investment tax credit were refundable, this discrimination against tax loss firms would be eliminated.

The implications of tax losses for investment incentives varies depending upon the pattern of taxable income for the firm. There is an indefinite number of time paths of tax losses that are possible depending upon the nature and history of the firm. For example, young growing firms might be expected to face a period of negative taxable income while they are undertaking investments and getting themselves established in the market. For them, the absence of loss offsetting provisions is particularly damaging. Large established firms are more likely to be in a taxpaying position, though older declining firms may well be in a phase of tax losses. For the latter, carry forward provisions are unlikely to be of mush use. The best that can be done is to base illustrative calculations on typical patterns of tax

losses, though some attempt has been made in the literature to use data on the actual histories of firms as a basis for effective tax calculations.[32]

3. The treatment of risk

The treatment of risky firms is related to the issue of loss offsetting since risky ventures can give rise to negative taxable income in some periods. As mentioned, two types of risk have been distinguished in the literature-income risk and capital risk. Income risk involves uncertainty about the future stream of net revenues because of such things as output price, wage rate and demand uncertainty. It is reflected in fluctuations in taxable income. As mentioned earlier, full loss offsetting is equivalent to allowing deductibility for income risk..However, in the absence of full loss offsetting, firms faced with income risk would be put at a disadvantage relative to non-risky firms. For the same reason, investment incentives will apply differentially to the greater advantage of less risky firms in the absence of full lopss offsetting.

Full loss offsetting is not sufficient to guarantee neutrality with respect to capital risk. Capital risk is defined to be uncertainty with respect to the rate of economic depreciation of capital after the capital has been installed.[33] Depreciation schedules for tax purposes are predetermined at the time of the investment, and are not adjusted for changes in subsequent actual depreciation rates. Indeed, given the fact that depreciation rates are not observable as market prices, it is not obvious how they could e adjusted to account for capital risk. In practice, the only way the deductibility of capital risk could be achieved would be by allowing depreciation writeoffs to occur up-front.[34] By the same token, incentive measures which accelerate the writing off of capital depreciation, such as accelerated depreciation, would simultaneously reduce the discrimination against risky investments and provide an incentive to investment. On the other hand, measures which do not accelerate the pattern of depreciation would not remove the discrimination against capital risky investments.

4. The cash flow effects of various incentives

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[32]See, for example, Auerbach and Poterba (1986).

[33]Capital risk was first analyzed by Bulow and Summers (1984).

[34]One such scheme which would accomplish this would be the Auerbach and Jorgenson (1980) proposal for capital write-offs which is to allow the firm to deduct the present value of its future of depreciation allowances up-front. This scheme would also be a substitute for the indexation of depreciation allowances in inflationary periods.

According to the neo-classical investment theory on which effective tax calculations are based, firms can obtain financing for investment at the going costs of finance for various sorts of finance. In practice, some firms, particularly small young ones may find it relatively difficult to raise external finance and may be viewed as being liquidity constrained. Presumably there would be a price at which they could obtain outside finance, but that price will be different from the going market price and may be very difficult for the investigator to determine. Under these circumstances, METRs may not be fully informative about the effects of investment incentives on the firm. It might be equally important to know the effects of the incentives on the cash flow position of the firms.

Given this, investment incentives will be more effective the earlier they get funds in the hands of the firms. A comparison of the time profile of the tax savings of various incentives will be important. From this perspective, investment tax credits would be the most beneficial, but, for non-taxpaying firms, only to the extent that they are refundable. Accelerated depreciation will be less so, and reduced tax rates even less so (since their benefit is greatest when revenues are highest, which is later than when the capital costs are incurred). The Auerbach-Jorgenson scheme mentioned above would also be beneficial to the cash flow of firms if refundability of tax losses exists, even though it is not an investment incentive as such.

5. The effect on the costs of financing and financial structure

In the METR methodology, the determination of the financial structure is suppressed from the analysis because of the lack of a widely accepted theory. Two alternative approaches to accounting for the differential tax treatment of different forms of financing are as follows. First, some studies (e.g., King and Fullerton (1984)) calculate separate METRs for different sources of finance. In this way the magnitude of the differential treatment of the different types of finance can be observed directly. Second, some studies use observed financial structures to calculate costs of capital for different types of firms. Since different types of firms systematically use different proportions of debt finance, the use of different weights for debt and equity finance in the cost of capital enables one to capture the effect of the differential tax treatment of debt and equity finance in METR calculations across industries.

In a sense, this is not an entirely satisfactory state of affairs. Measuring the differential effect of taxes by source of finance is not sufficient for indicating how firms will change their financial structures in response. In that sense, the tax effects cannot form the basis for a positive analysis of the effects of taxes on the financial structure of firms. At best, the direction of tax incentives can be deduced as well as prescriptions for tax reform. Some studies take the extreme view that only taxes matter in

determining financial structures.[35] This leads one to the so-called *it cash flow* or *it pecking order* theory of finance whereby firms use up the least cost source of finance first. Again, by concentrating solely on tax explanations as determinants of the financial structure, tax policy arguments about how to avoid distortions of the financing decision can most readily be seen.

Perhaps more importantly, by taking the financial structure and the costs of various sources of finance (i, ρ *and* o) as given to the firm, one may not be capturing important differences between the marginal and average costs of various sources of finance. If firms are optimizing their financial structures, one might expect that the marginal cost of various sorts of finance will be the same. In this case, it might seem inappropriate to attribute different costs of finance to debt and equity in METR studies.[36] However, as has been argued in Boadway, Bruce and Mintz (1987), if financial decisions are separable from investment decisions, the optimizing choice of financial structure will give rise to different equilibrium values of the costs of various sources of finance which are appropriately used in METR calculations.

Consider, for example, the cost of funds given by equation (32) above. In it, $i(1 - u)$ and ρ_g represent the *average* costs of debt and equity finance to the firm, but note the *marginal* costs. The marginal cost of funds will take into account the effect of an extra dollar of financing of either sort on the amount the firm must pay its creditors as a result of a marginal change in the firm's financial structure. Suppose that the rate of interest the firm must pay increases with the debt-equity ratio. The marginal cost of raising a dollar of debt exceeds $i(1 - u)$ because an extra dollar of debt raises the debt-equity ratio and the interest rate the firm must pay on all its debt. Similarly, the marginal cost of an increment in equity financing is less than ρ_g because this extra equity financing lowers the debt-equity ratio and reduces the cist of debt. Thus, the firm will hold a diversified stock of financial liabilities even though the average costs of the two sorts of finance differ. It can be shown that when the cost of finance depends only upon the debt-equity ratio, the firm's financial structure will be determined independently of investment, and the marginal cost of funds will exactly equal the weighted average of

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[35] Examples include Stiglitz (1976), Auerbach (1983), Poterba and Summers (1983) and Boadway and Bruce (1992).

[36] This point has been made by Hansson and Stuart (1985).

$i(1 - u)$ and ρ_g .[37] This would, therefore, justify the procedure used in the METR analysis of treating the cost of finance as a weighted average of the average costs of debt and equity finance.

The relevance of this discussion of financing for investment incentives is rather limited since most investment incentives do not apply to the financing costs. At the same time, investment incentives may well play an important role in providing finance to the firm as we have already pointed out. Probably the cash flow effects of investment incentives are the most important ones.

6. The interaction of inflation and investment incentives

Most corporate taxed have very little provision for inflation built into them. Interest deductions tend to be based on nominal interest rates and depreciation is calculated in historic rather than replacement terms. This implies that inflation affects the real value of the tax base. The effect of inflation on the METR is, however, ambiguous *a priori*. The lack of replacement cost depreciation implies that increases in inflation will reduce the value of the depreciation write-off, thereby tending to increase the METR.[38] At the same time, the ability to deduct nominal interest means that in times of inflation firms are effectively able to write off part of the principle of their debt. This reduces the cost of finance and tends to reduce the METR. Depending on the relative magnitude of these two effects, inflation could increase or decrease the METR. It is more likely to increase it the more important is debt as a source of finance and the slower is the write-off for depreciation. This ambiguity has been borne out in various studies of METRs. The absence of full loss offsetting will also be important in determining the effect of inflation on the METR.

Naturally investment incentives will have differing effects depending on the rate of inflation. Tax rate reductions tend to reduce the absolute size of the METR so preserve whatever inflation bias already exists. Accelerated depreciation reduces the disadvantage of historical cost depreciation so should be especially beneficial in times of inflation. Investment tax credits provide an additional advantage which is independent of the rate of inflation (since it occurs up front) without affecting the existing interest and depreciation deductions. Thus, its effect will be relatively independent of the rate of inflation, at least as long as the benefit of the tax credit is not postponed because of imperfect loss offsetting. This may be viewed as another advantage of investment tax credits over other forms of investment incentives.

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[37] This is demonstrated formally in Boadway (1987) and discussed in more detail in Boadway, Bruce and Mintz (1987).

[38] Similar arguments apply to the deduction for inventory usage.

7. The interaction with other policies

The corporate tax system is not the only source of policy influence on the incentive to invest. Other taxes will also have an effect, such as indirect taxes. As well, tariffs will have an obvious effect on protected activities. Very few attempts have been made to incorporate other taxes into METR calculations, though, in principle, it should be straightforward to do.[39] In the context of developing countries, it might be particularly useful to include other distortions in the computation of METRs when evaluating investment incentives.

8. Effects on the timing and durability of investment

Taxes can affect investment in ways other than simply the size of the demand for capital. They can effect that path of accumulation of capital as well as the durability of capital. In the case of temporary investment incentives, part of the effect may simply be to accelerate the holding of a given amount of capital. This might be the case for a tax holiday, for example. Effective tax rate calculations can be done on an annual basis over the period of the tax holiday to see how the incentive to invest changes. We present some sample calculations of this below.

Permanent incentives will affect the long run demand for capital. However, they may influence the chosen durability of capital. It is known from the literature that accelerated depreciation schemes are neutral with respect to the durability of capital, while investment tax credits induce firms to employ shorter-lived capital. The reason for the latter is that investment tax credits apply on gross investment thus reducing the cost of replacement capital. The subsidy to replacement capital means firms will have an incentive to choose capital which depreciates more quickly. This may be viewed as a disadvantage of investment tax credit schemes to be set against the advantages already listed.[40]

There may be other types of decisions involving capital expenditures which firms will take. One important one may be technique of production, especially capital intensity. Incentives which apply to capital purchases but not to other inputs will give firms an incentive to substitute capital for the other inputs, including labour. To the extent that the creation of employment is an objective, this is a

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[39] One exception is Chua (1991) who has incorporated the system of indirect taxes into calculations of METRs in Malaysia using input-output data.

[40] Bradford (1980) analyzes the design of investment tax credits which are neutral vis-à-vis the durability of capital. He shows that no simle general rule is possible. In general, a credit varying with the durability of the investment is required.

disadvantage. The ability to do depends upon the elasticity of substitution, which may vary from sector to sector.

9. Special problems arising in open economies

Some additional considerations arise in economies whose capital markets are exposed to international capital markets. In these cases, capital may move across international borders in response to tax measures affecting investment. If there were no impediments to capital moving in and out of the country and if the country were small relative to the rest of the world, the required rate of return on capital would effectively be predetermined for the country by international capital markets. An implication of this is that the saving and investment sides of the domestic capital market would effectively be segmented. That is, in any given year there would be no need for domestic saving to equal domestic investment. Tax measures applying to firms, such as investment incentives, would affect the investment side of the market but not the saving side. Similarly, tax measures applying on households would affect saving alone. Thus, imputation measures which are implemented through the personal tax system would have no effect on domestic investment. Any induced changes in the capital account balance would be met by net inflows or outflows of capital from foreigners.

One of the implications of this is that the METR on a capital decision can be disaggregated into that applying on the investment side and that applying on the saving side. Let r^* be the international cost of finance in real terms. It can be defined as follows:

$$r^* = \beta i^* + (1 - \beta)\rho^* - \pi \qquad (33)$$

This represents the opportunity cost of funds to the country as determined on world capital markets. The marginal effective tax rate applying on investment decisions can then be defined as follows:

$$t_I = r_g - r^* , \qquad (34)$$

where r_g is defined as before. Similarly, the marginal effective tax rate applying on saving decisions is defined as:

$$t_S = r^* - r_n \qquad (35)$$

By construction, METR equals the sum of r_g and r_n.

The open economy assumption makes matters simpler for us when investigating investment incentives. If the incentives operate on firms, their full effect can be captured by looking solely at t_f. In other words, personal taxes become irrelevant. Incentives operating through the personal tax side (such as dividend tax credits to domestic shareholders) do not affect investment decisions.[41]

While that simplification is possible, the ability of capital to flow across borders introduces a number of other issues to be considered. They include the following:

a. The effect of tax incentives on foreign firms. Foreign firms typically are liable for taxes both in the host country and the home country. However, some credit may be given in the latter for taxes paid in the host country. Most countries operate a foreign tax crediting system under which taxes paid abroad are credited against domestic tax liabilities up to the amount of the latter.[42] This means that to the extent that host country tax liabilities are within the limit set by home country taxes, revenues are transferred from foreign treauries to that of the host country. This provides an incentive for host countries to design their tax systems so as to exploit the transfer of tax revenues from foreign treasuries to domestic ones to the fullest. In these circumstances, the host country tax system may have limited effect on the investment behaviour of foreign firms unless host taxes are high enough to exceed home country tax liabilities. If they do not, any effect that host country taxes have on the incentive to invest will be limited to that arising from the deferral nature of home country taxes and tax crediting.[43]

In these circumstances, investment incentives which reduce the tax liabilities of foreign firms may have limited effect on the incentive of foreign firms to invest, and may serve largely to transfer funds to home country treasuries. This could only be avoided if, for some reason, the foreign tax crediting provision did not apply to the investment incentive.

2. The implications of alternative crediting arrangements

One of the reasons for levying corporate taxes in developing countries is to effect a tax transfer from treasuries in home countries of foreign corporations. This is a consequence of offering a foreign

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[41] That is not altogether true. They will have some general equilibrium effect on investment, but that will presumably be of second order importance.

[42] Often the domestic tax liabilities are not calculated until funds are repatriated and crediting does not occur until then. There are other complicating features of these systems involving averaging of credits over time and countries as well. For a full discussion see Alworth (1988).

[43] See Leechor and Mintz (1990) and Hines (1989) for formal analyses of this.

tax credit for taxes paid in the host country as is done, for example, by the United States. Host countries can raise revenue almost costlessly[44] by setting their tax rates close to those of host countries.

This ability to transfer revenues from foreign treasuries is contingent on the foreign countries operating a credit system. As has long been recognized, if foreign treasuries allowed firms only to deduct foreign tax liabilities from taxable income rather than crediting them, a tax transfer would no longer be possible. Under these circumstances, the corporate tax would be fully absorbed by a higher required rate of return on capital, and the tax will effectively be borne by other domestic factors of production (such as labour). In these circumstances, the corporate tax would discourage foreign investment, and thus investment incentives would encourage it.

At the moment, tax credits are the norm. However, that situation may not persist. From the point of view of creditor nations, deduction systems make much more sense than credit systems, as Feldstein and Hartman (1979) have pointed out. Deduction systems avoid the turning over of tax revenues to capital-importing countries. One of the mysteries in the literature on the international taxation of capital income is how credit systems ever came into being given that it seems not to be in the interest of capital-exporters to have such systems. As countries such as the United States review their arrangements it might not be surprising to see some changes from crediting to deductions. If so, the role of the corporate tax and the efficacy of investment incentives would change significantly.

3. *Tax Haven and Conduit Countries*

The ability of firms to siphen profits through tax haven countries will also influence the effectiveness of investment incentives. Tax havens are low tax countries which have some other special features such as rules governing confidentiality and secrecy, a lack of currency controls, and highly developed banking and financial activities. Tax havens can be used to reduce tax liabilities to the extent that firms can set up in the tax haven and arrange to shift earnings to it via one of a variety of arbitrage mechanisms (financial transactions, transfer pricing, etc.). A disproportionate share of holding and investment companies and shipping companies have been set up in tax havens. Many countries have enacted provisions to attempt to limit the extent of tax avoidance through tax havens.[45]

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[44] Given the advantages of deferral, host country taxes will impose some distortion, as mentioned above.

[45] Some discussion of the problems arising with tax haven countries may be found in Alworth (1988).

C. Some Illustrative Calculations of METRs: The Case of Malaysia

In this section, we present some sample calculations of the effect of investment incentives on METRs for the case of Malaysia. The Malaysian case is instructive since the types of incentives, as well as the basic tax structure itself, are typical of what one finds in many developing countries. As well, the system underwent a reform in 1989 whose effects we can calculate. We begin with a brief description of the tax system as it affects capital income at the personal and corporation levels.[46]

Most forms of capital income (e.g., interest and dividends) are fully taxed at the personal level at ordinary rates. The rate structure is progressive, with rates rising from 5% to 40%. The main exceptions to this are dividends received from firms operating under a tax holiday (so-called *pioneer firms*) and capital gains. Both are tax exempt. As well, there are various forms of sheltered savings as in most countries, such as pension savings and housing. For dividends from non-pioneer firms, the personal and corporate tax systems are fully integrated. That is, a dividend tax credit is given to resident corporations for corporate taxes paid at the corporate level. The dividend tax credit rate is 40%. Dividends paid to foreigners are subject to a 40% withholding tax on dividends. The tax reform of 1989 did not affect these provisions.

Before 1989, the company tax rate was 40% plus an additional 5% development tax. Companies with income in excess of M$2 million paid a 3% excess profits tax. In the 1989 Budget, the income tax rate was reduced to 35% and the development tax was to be phased out over five years. Firms do not pay tax on capital gains or on intercorporate dividends, so corporate income is taxed only once. Corporation taxable income is defined the way it is in most tax systems to include business income less current and capital costs, where the latter include nominal interest costs and depreciation. Depreciation rates vary by type of asset and by type of industry. Typically, an initial allowance is given followed by straightline depreciation of the remainder of the original cost. While taxpaying firms incur tax liabilities immediately, tax loss firms are not treated symmetrically. Tax losses may only be carried forward indefinitely without interest.

Investment incentives take a variety of forms. As mentioned, different industries face different rates of depreciation. As well, there are two special types of incentives. First, there is an investment tax credit available to non-pioneer firms. The investment tax credit is given on a discretionary basis and is awarded at varying rates ranging all the way up to 100%. Second, there are tax holidays granted to firms who apply successfully for pioneer status. Firms granted pioneer status are free of corporate

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[46] A more detailed description can be found in Boadway, Chua and Flatters (1989), from which these illustrative calculations are drawn.

income tax for a period of time (usually five years) following the investment in question. Pioneer status may be extended for up to five further years when the first period expires. Before 1989, pioneer firms were permitted to carry forward without interest their depreciation allowances cumulated from the pioneer period to the year following this period. No other component of taxable income could be carried forward in this way. The 1989 Budget eliminated this carry-forward provision.

As can be seen, the tax treatment of firms depends upon the industry in which they operate, whether they are taxpaying or tax loss firms and for how long, and whether they are pioneer firms or not. In evaluating the effects of the 1989 reforms, a separate calculation should be done for each type of firm. In what follows, we distinguish only between taxpaying and tax loss status, and between pioneer and non-pioneer status. For simplicity. inter-industry differentials are ignored. The calculations are based on rather crude data. However, our purpose here is to provide illustrative calculations, not definitive results.

We begin by adopting our earlier theory to the institutional setting at hand. First, we invoke the open economy arbitrage assumption discussed earlier. This involves asumming that the rate of return on capital is determined on international capital markets and allows us to disaggregate the METR into a corporate tax distortion, t_c, and a personal tax distortion, t_p. Consider the derivation of t_c first.

To calculate t_c we need an expression for the pre-tax rate of return on investment r_g. Our procedure is to adopt equation (13) derived earlier to a discrete-time setting which corresponds with the Malaysian tax system. The firm's problem can be written as:

$$\underset{K_t}{\text{Max}} \sum_{t=0}^{\infty} R_t[P_t F(K_t)(1 - u_t) - Q_t (K_{t+1} - (1 - \delta)K_t)(1 - Z_t)]$$

where the discount factor R_t can be written:

$$R_t = \prod_{s=0}^{t} \frac{1}{1 + r_s}$$

where r_s is the nominal after-tax cost of finance to the firm in period s. It is a weighted average of the one-period interest cost (cost of debt) and the rate of return on equity, where the weights are the proportions of debt and equity used in the financing of cash flows.

Solving this problem as discussed earlier, the analogy to equation (13) is:

$$r_g(t) = \frac{(r_t - \pi_t + \delta - (\Delta q/q)_t)(1 - Z_t) + 1 + r_t - \pi_t - (\Delta q/q)\, t)\,(Z_t - Z_{t-1})}{1 - u_t}$$

$$- \delta + (\frac{\Delta q}{q})\, t \qquad (36)$$

Here, $(\Delta q/q)\, t = \Delta Q_t / Q_t - \pi_t$ and the rest of the variables are defined as before, except that now they are defined for a discrete period rather than for a point in time. It will simplify matters if we assume that $(\Delta q / q)_t = 0$ and if we ignore $(r_t - \pi t)(Z_t - Z_{t-1})$ since it will be very small. Then the expression for r_g simplifies to:

$$r_g\,(t) = \frac{(r_t - \pi_t + \delta)(1 - Z_t)\,(Z_t - Z_{t-1})}{1 - u_t} - \delta \qquad (37)$$

To implement (37) we need to compute for each type of investment each of the parameters on the right-hand side, distinguishing especially how they vary with tax status of the firm. The expected inflation rate π and the depreciation rate δ are independent of the tax status of the firm and are computed as already discussed. We need only discuss how the nominal cost of finance r_t, the present value of future depreciation write-offs Z_t and the effective statutory corporate tax rate u_t vary with tax status. We do so for firms with three types of tax status--fully taxpaying non-pioneer firms, profit-making pioneer firms, and tax-loss non-pioneer firms.[47]

1. Taxpaying Non-Pioneer Firms

A taxpaying non-pioneer firm is simply one which earns positive taxable income in present and future periods. It is taxed at the full rate in each period. Therefore, the effective statutory corporate tax rate facing the firm is simply the statutory rate u which we assume is not expected to change.

The nominal cost of funds r_t, faced by the firm is the weighted combination of its after-tax borrowing costs and the cost of raising equity from the financial market. Again, assuming these are expected to be constant over time, the cost of funds for all periods will be given by:

$$r = \beta i(1 - u) + (1 - \beta)\rho$$

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[47] Tax-loss pioneer firms are not explicitly considered since they are similar to taxpaying pioneer firms if they become profitable before pioneer status is finished, and to tax-loss non-pioneer firms otherwise.

where these variables are defined as before. Note that with capital gains untaxed, and the full imputation of corporate taxes essentially ensuring that dividends are not taxed at the personal level, the cost of equity ρ is the same whether it comes from new issues or retained earnings. At the same time, since interest is tax-deductible, the cost of debt financing is $i(1 - u)$. This reflects the tax preference given to financing by debt over equity at the corporate level.[48]

Finally, consider the present value of tax savings due to depreciation, Z_t. As mentioned, firms are given an initial allowance and then allowed to depreciate the remainder under straightline depreciation. If τ is the rate of initial allowance and T is the length of time over which the asset can be depreciated (so $1/T$ is the annual rate of depreciation), Z_t will be given by:

$$Z = u\gamma + \frac{(1 - \gamma)u}{rT}\left(1 - \left(\frac{1}{1 + r}\right)^T\right) \tag{38}$$

We have dropped the time subscripts because here Z_t and Z_{t-1} will be the same under the assumptions we are making. The first term is the tax benefit from the initial allowance and the second is the present value of the tax savings from the straightline write-off of the remaining $(1 - \tau)$ of the investment.

2. Profit-Making Pioneer Firms

Next, consider the case where a firm is granted a five-year tax holiday. No taxes are paid by the firm over the tax holiday period. We begin with the pre-1989 Budget case in which initial and depreciation allowances could be delayed until the end of the tax holiday. All accumulated tax savings from the initial and annual depreciation allowances could be set off against revenues earned by the firm in the first tax year following the tax holiday period. We assume that the profits in the period immediately following the tax holiday are sufficiently large to absorb all depreciation allowances that have accumulated over the tax holiday period.

These features of the tax treatment of pioneer firms make the computation of the before-tax rate of return on investment considerably more complicated than case 1 above since u_t, r_t and Z_t will all vary over time. Consider the computation of the three in turn.

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[48] Note that, given the taxability of interest but not equity income at the personal level, households have an incentive to hold equity.

The effective statutory corporate tax to the firm over the tax holiday period is zero since the firm is completely exempt from paying any tax on its income. However, the corporate tax rate will revert to its full statutory rate u after the tax holiday. Therefore,

$$u_t = \begin{cases} 0 \text{ for } 0 \le t \le 4 \\ u \text{ for } t > 4 \end{cases}$$

where $t = 0 \cdots 4$ represent the tax holiday periods. Given these values for u_t, the cost of finance to the firm is given by:

$$r_t = \beta i(1 - u_t) + (1 - \beta)\rho$$

Finally, given u_t and r_t, the value of Z_t will be given by:

$$Z_t = \left(\frac{1}{1 + r_t}\right)^{5-t} \left(u\gamma + \frac{(5 - t)u(1 - \gamma)}{T} + \frac{u(1 - \gamma)}{rT}\left(1 - \left(\frac{1}{1 + r}\right)^{T-5+t}\right)\right) \qquad (39)$$

$$0 \le t \le 4$$

This equation takes into account the fact that Z_t will vary according to when within the tax holiday period the investment is undertaken. Note that in the tax holiday Z_t is a monotonically increasing function of t. This implies that r_g will vary over the pioneer period, becoming constant with the return to full taxpaying status.

We have mentioned that firms may also obtain an investment tax credit. Typically, this will be in lieu of the initial allowance and of the tax holiday. Like the latter it is granted on a discretionary basis. We discussed earlier how the investment allowance enters into METR calculations so we do not repeat it here.

Subsequent to the 1989 Budget, firms were no longer allowed to carry depreciation allowances forward from the pioneer period to the fully taxpaying period. This causes the expression for Z_t, (39), to change to:

$$Z_t = \left(\frac{1}{1 + r_t}\right)^{5-t} \left(\frac{u(1 - \gamma)}{rT}\left(1 - \left(\frac{1}{1 + r}\right)^{T-5+t}\right)\right) \quad 0 \le t \le 4 \qquad (40)$$

The depreciation and initial allowances from the pioneer period are lost now. The expressions for u_t and r_t remain the same as before. The statutory tax rate u was also reduced by the reform and this must be taken into account in the calculations.

3. Firms in Temporary Loss Positions

Consider now the case of a firm that is making a temporary loss over the first few periods of its operation and a profit thereafter. For illustrative purposes, assume the firm which is incurring tax losses years 0 to 4 of its operations. These losses are carried forward into year 5 and set off against income in that year before taxes are paid. Suppose taxable income is large enough in year 5 to absorb all cumulated losses.

Consider first the cost of finance to the firm. Since the firm is in a loss position, it cannot obtain the full instantaneous benefits of the interest deduction. Instead, the benefit is deferred until future periods when the loss carryforward is offset by taxable income. This deferral reduces the value of the tax saving of the interest deduction, and therefore increases the after-tax cost of finance to the firm. The exact amount by which the tax advantage is reduced is rather complicated to calculate. To explain it, it is useful first to consider a firm that finances new investment entirely with debt. In this case, the effective tax rate applying to the interest deduction will be less than u because of the deferral of the interest write-off. The cost of interest finance in a period in which the firm is making losses is given by:

$$r_t = i\left(1 - \frac{u}{\prod_{s=t}^{4}(1+r_s)}\right) \qquad t = 0, \cdots, 4 \qquad (41)$$

This expression reflects the fact that the tax savings from interest costs incurred in an early time period are postponed until period 5. This tax saving must be discounted back to period t to yield its present value as of the time that the interest cost is incurred. The tax saving in period 5 is evaluated at the full corporate tax rate u applying to the firm at that time.

Equation set (41) gives relations among the r_t for each of the five loss periods. It must be solved simultaneousiy for the values of r_t. To do so, we proceed recursively backwards. First, solve for the cost of funds in the last period, $t = 4$. In this period, equation (41) is quadratic in r_4 alone. Then, substituting this solution for the positive root of r_4 back into (41) we obtain a quadratic equation in r_3, which can also be solved for its positive root. The entire set of r_t's over the loss period can be obtained by substituting recursively into (41) one at a time. At period 5, once the firm is profit-making, the usual expression for r_t applies.

The same principle can be extended to the case when the firm uses some equity finance. In this case, r_t is given by:

$$r_t = \beta i_t + (1 - \beta)\rho \qquad t = 0, \cdots, 4$$

where

$$i_t = i\left(1 - \frac{u}{\prod_{s=t}^{4}(1 + r_s)}\right) \qquad t = 0, \cdots, 4 \tag{42}$$

As above, this equation can be solved recursively for r_t during each loss period. This is the set of r_t's we use in our computations.

A similar derivation applies to u_t. Since tax liabilities are carried forward without interest from the loss periods to period 5, the effective tax rate that the firm faces during the period of losses is less than the statutory rate. Using the cost of finance as derived from (41), the effective corporate tax rate applying to the revenues of the firm is:

$$u_t = \frac{u}{\prod_{s=t}^{4}(1 + r_s)} \qquad t = 0, \cdots, 4$$

Given r_t, this is straightforward to compute.

Finally, the present value of tax depreciation allowances Z_t will also be modified slightly to account for the fact that unabsorbed depreciation allowance may also be carried forward to year 5. It will be given by:

$$Z_t = \prod_{s-t}^{4-t}\left(\frac{1}{1 + r_s}\right)\left(u\gamma + \frac{(5 - t)u(1 - \gamma)}{T} + \frac{u(1 - \gamma)}{rT}\left(1 - \left(\frac{1}{1 + r}\right)^{T - 5 + t}\right)\right)$$

$$t = 0, \cdots, 4 \tag{43}$$

For $t \geq 5$ the expression for Z_t is again given by (38). As before, Z_t increases with time over the loss period.

Using these expressions for r_t, u_t and Z_t, the time profile for $r_g(t)$ can be calculated for each of the three cases. For $t \geq 5$, the values of $r_g(t)$ will all be the same as in case 1. The marginal effective corporate tax rate will then be given by

$$t_c = t_g - r^*,$$

where r^* is the cost of funds determined on international capital markets and is given by $r^* = \beta i + (1 - \beta)\rho - \pi$, as discussed before.

We could also calculate the marginal effective personal tax rate t_p as discussed earlier. However, given our open economy arbitrage assumption, it would be irrelevant for evaluating investment incentives. Its effect is felt entirely on the saving side of the domestic capital market. As mentioned, given the absence of taxation of capital gains and the imputation of corporate taxes to domestic savers, the effective personal tax rate would be near zero for equity funds. Indeed, saving through purchases of new equity could be subsidized given that the corporate tax rate can exceed the personal tax rate so the imputation more than offsets any personal taxes owing on dividends. However, the marginal effective personal tax rate could be substantially larger for interest since interest is not only fully taxed, but it is taxed in nominal terms. Therefore, the tax system gives a sizeable incentive for domestic residents to hold equity over bonds. Since the corporate tax system does precisely the opposite, there is a net incentive to import debt capital and export equity capital. The reduction in the corporate tax rate by 10 percentage points with the tax reform of 1989 reduces the magnitude of this relative financing incentive for equity but not its direction.

Some marginal effective corporate tax rate calculations are presented for the three cases in Tables 1, 2 and 3 respectively. Each Table reports t_c for machinery for five consecutive years under the pre-1989 and post-1989 tax systems. The main differences in the tax systems are that the rate is reduced from 45% to 35% and the deferral of depreciaiton allowances for pioneer firms is eliminated by the tax reform. The data used in the Tables also differs from one to another. For the fully taxpaying firm, actual data for the years 1983-87 are used for financial variables, while for the tax loss and pioneer firms, 1983 data are used. For all examples, t_c is calculated separately for debt-financed and retained-earnings financed investments[49] as well as for a weighted combination of the two, where the weights were computed from Kuala Lumpur Stock Exchange unpublished data. Rates of return on equity were also calculated from the same source using the return to shareholders' fund. Corporate lending rates were not available so a base case of 12% was used for illustrative purposes. Actual inflation rates were used as expected ones and therefore perfectly anticipated. Again, it should be stressed that these calculations are intended to be illustrative only. A summary of results for each of the cases follows.

a. Taxpaying Non-Pioneer Firms

As the first column of Table 1 indicates, t_c is consistently negative for debt-financed investments owing to the deductibility of nominal interest payments. Fluctuations from year to year are due to

[49] From the point of view of the corporation, the tax system affects new equity and retained earnings in the same way.

changes in the rate of inflation. Apparently, the benefit of nominal interest deductibility in times of inflation more than offsets the disadvantage of historic cost depreciation, which tends to reduce the value of Z_t. Conversely, t_c for retained earnings is positive as shown in the second column. The cost of equity financing is not tax-deductible. In these cases, years of lower inflation (1985 and 1986) tend to lower t_c. The last column uses observed weights of debt and equity financing to calculate t_c when both sources are used at the margin. Naturally, t_c falls between the pure debt-financed and equity-financed cases, but is negative in all years. Thus, the corporate tax system actually subsidizes investment at the margin.

The last three columns of the Table report what t_c would have been had the post-1989 tax structure been in place. Essentially this involves a reduction in u from .45 to .35. The qualitative comparisons among the various cases remain exactly as before, but the absolute magnitudes are all reduced. Positive values of t_c become smaller and so do negative values.

b. Profit-Making Pioneer Firms

Table 2 shows t_c's for a firm granted pioneer status in 1983. Ideally we would show the rates applying to marginal investments undertaken in each of the five years of the tax holiday period; but absence of pertinent data for 1982 precluded this, and so we report rates for only the final four years of the tax holiday. The last entry in each column shows t_c in the absence of pioneer status using 1983 data. (Here S.S. refers to steady state.) It is taken from Table 1.

Note that pioneer firm investments financed from all sources are subsidized by the tax system. However, the size of the subsidy is quite small. For debt-financed investments, the tax-induced subsidy is actually less than for non-pioneer firms. Such investments are penalized by pioneer status. Basically, the advantages of interest deductibility during the tax holiday no longer exist. For equity financing, this is not the case. Pioneer status converts t_c from positive to negative. There is no loss in foregoing interest deductions. At the same time, firms benefit from being able to carry forward their initial and depreciation allowances until after pioneer status is finished. Thus, in principle it seems that pioneer status might serve either to increase or decrease investment incentives. Which way it works in practice will depend on which of these two effects is most important for the firm in question. If the tax burden on current revenues less interest deduction is larger (in a present value sense) than the tax savings from depreciation allowances, the first effect would be expected to dominate, and pioneer status would increase investment incentives, and *vice versa*. More generally, the granting of pioneer status tends to reduce the impact of the tax system on marginal investment decisions. If investment is penalized under the general tax laws, then pioneer status will reduce this disincentive. But if investments are subsidized, pioneer

status will reduce the size of the subsidy. For Malaysian firms it turns out that pioneer status eliminates the bias of the tax system in favor of marginal investments financed by debt rather than equity, and provides a net additional subsidy only to investments with sufficiently low debt-equity ratios.

Table 2 also reports effective corporate tax rates under the post-1989 tax structure. In addition to the reduction in u, the ability of pioneer firms to defer initial and annual depreciation allowances until the end of the tax holiday period was removed. As can be seen from Table 2, pioneer firms now face a large positive t_c as compared with the net subsidy received under the previous system. Not only has the sign of the distortion been changed in this case, but its absolute size has been increased considerably.

Debt-financed marginal investments continue to be treated more favorably for non-pioneer than for pioneer firms after the tax reform. In the case of equity-financed investment, machinery is now slightly better treated for non-pioneer firms. This is also for the reason mentioned above, that the loss of depreciation tax savings during the pioneer period is more important for machinery. The tax reforms also have the effect of reducing the differences in distortions between pioneer and non-pioneer firms.

3. Tax Loss Firms

Table 3 presents estimates of t_c for firms in a temporary loss position for five years. We take 1983 as the presumed initial year of the firm's operations. As in the case of a pioneer firm, we calculate t_c during the final four years of the loss period and the steady state for both the pre-1989 and post-1989 tax regimes.

Under the pre-1989 tax rules, debt-financed investments receive a small subsidy during the tax loss period, but it is considerably less than that received for a fully taxpaying firm. The size of the subsidy increases over time (during the tax-loss period). In the case of equity-financed investments, t_c is positive. It declines over time, but remains more than double that facing tax-paying firms on the same investments. For firms financing investments through a combination of debt and equity, the tax system discourages investment for loss firms, while subsidizing investment for tax-paying firms.

The 1989 tax reforms do not change any of the qualitative patterns of investment distortions facing tax loss firms, but they have the uniform effect of reducing the magnitude of all the positive and negative tax incentives. This is the same thing that was observed earlier in the case of taxpaying firms.

To summarize, the corporate tax system plays an important role in determining the relative profitability of different types of investments. For some investments, it provides a considerable net subsidy. But many other investments are faced with sizeable tax penalties. The overall pattern of

incentives and disincentives bears no obvious relation to social economic goals that might in principle guide the construction of an incentive system. The unintended consequences of these distortions, therefore, almost certainly include significant waste of investment resources. As well, some incentives can have the opposite effect to what is intended. The example of tax holidays is very instructive since many developing countries resort to it. Our calculations show that tax holidays can actually impose a net penalty on investors in some cases. It is of possible value only to firms with sufficient taxable profits against which to use the benefits of the tax holiday; i.e. it is highly unlikely to be of value to the weak or infant investors or to the industries which usually are the intended beneficiaries of the measures. Similarly, tax rate reductions can reduce the incentive to invest, especially for firms which already have negative marginal effective tax rates. Finally, many measures have very differing effects according to the type of firm and investment under consideration. This is especially true of comparisons between tax loss and taxpaying firms.

V. The Impact of Tax Incentives on Investment: A Brief Survey of the Empirical Approaches and Applications in Developing Countries

The empirical analysis of tax incentives for developing countries is of recent origin, and only a few published studies are available as of this date (see e.g. Agell, 1985, Ebrill, 1987). In industrialized nations, empirical approaches to evaluation of tax incentives have varied from opinion surveys to rigorously derived testable models; from partial equilibrium to general equilibrium; and from macro- to microeconomic analysis. This Section provides an overview of the principal approaches, notes their key assumptions and caveats and discusses the findings of recent developing country applications.

A. Surveys of Firms

Opinion surveys of company executives have been frequently used to evaluate the effectiveness of tax incentives (see Guisinger and Associates, 1985). An objective assessment of the impact of tax measures is not possible through opinion surveys. Opinion surveys do not provide data on observed behaviour both before and after a policy change, and, hence, the validity of their results are doubtful. In spite of these limitations, opinion surveys can serve as a useful complement to more rigorous empirical analysis of these issues.

Two recent opinion surveys have explored the effectiveness of investment incentives in developing countries. Guisinger and Associates (1985) sought to examine the policies of governments and companies towards foreign direct investment in both developed and developing countries. In an attempt to be

comprehensive, the study examined incentives ranging from tariffs to free trade zones. The study, however, failed to provide any hard evidence on the effectiveness of one or more such incentives. It relied on a survey of opinions of company executives selected arbitrarily to measure the impact of incentives on business location decisions. The executives were simply asked whether they would have still located in a particular country if no incentives were offered to them by the country in question but competitor countries maintained their incentive packages at their traditional levels. The responses in general were expectedly negative. The respondents indicated that "in this hypothetical case, the absence of incentives would have affected their decision, even though, in the real instance, the presence of incentive was not a major factor in their decision" (see Guisinger and Associates, 1986, p.166). In brief, the Guisinger study suffered from a poor choice of questions for the opinion survey and purely arbitrary sampling design (i.e., stratified random sampling procedures were not followed), and it failed to shed any new light on the effectiveness of tax measures to stimulate foreign direct investment.

Halvorsen (1992) has also analyzed the Thailand Board of Investment's survey data on responses by investors. It is interesting to learn that investors ranked exemption/reduction of import duties on machinery and equipment and of business taxes as the most important incentive followed by reduction of import duties and business taxes on raw materials. The corporate tax holiday was ranked third. Permission to bring in foreign technicians was ranked as fourth.

B. Estimation of Ad Hoc/Eclectic Equations

This approach usually specifies private investment to be a function of a host of independent variables including tax related variables. Variables selection and model specification is most often based on a "fishing expedition" for a high coefficient of multiple determination, R^2. Ebrill (1987) uses cross-section data on 31 developing countries for 1980 to examine the effect of cost of capital on investment. The dependent variable was the share of gross domestic investment in gross domestic product for 1980. Other than the cost of capital, independent regressors included: average annual growth rate of exports; share of minerals in exports; average annual growth rate of *GDP*; current account balance; inflation rate; and per capita *GDP*. He found that the coefficient of the cost of capital was negative and significant for the sample as a whole but when Argentina and Chile--two high-inflation countries--were excluded, the cost was capital had the negative sign but it was statistically insignificant. Thus, Ebrill's results only confirmed a weak relationship between the cost of capital and the level of investment.

C. Investment Models

Investment models could be broadly classified into the following five categories:

(i) The Flexible Capital Stock Adjustment Model, or the Accelerator Theory of Investment;

(ii) The Q-Theory;

(iii) General Forward-Looking Models;

(iv) Effective Tax Rate and Return-Over-Cost Models; and

(v) Marginal Effective Tax Rate Models.

The above list of investment models is not exhaustive. For example, the corporate finance literature suggests that cash flow and pay-back period could be important considerations in business investment decisions. These ideas have not yet found application in the empirical work on tax incentives. A brief description of the approaches listed above is given in the following paragraphs.

1. The Flexible Capital Stock Adjustment Model

The simple, or naive, form of the acceleration principle postulates a certain fixed relationship between the desired capital stock and output. It is argued that tax incentives affect investment through changes in desired capital stock by reducing the relative price of capital. Changes in the desired capital stock then lead to changes in net investment (or disinvestment). Shah and Baffes (forthcoming) utilize this principle in a production structure approach to examine the effectiveness of tax incentives in Pakistan.

2. The Q-Theory

The essence of Tobin's Q-theory model is that a firm will invest as long as a dollar spent buying capital raises the market value of the firm by more than one dollar. Since q is defined as the ratio of the market value of existing capital to its replacement, then investment will take place as long as q is greater than unity. Q-theory has not yet been used to analyse the effectiveness of investment incentives in developing countries.

3. General Forward-Looking Models

The decision rule governing investment in General Forward-Looking Models (GFL) is identical to that in the *Q*-theory, but the two theories differ in how the unobservable expectations are related to observable variables. Unobservable expectations have been defined in either one- or two-step transformation procedures. The two-step procedure is based on a decomposition of the investment

problem into expectation formation, and given these expectations, the decision to acquire investment goods. Expectations are based on lagged variables, and the parameters derived from expectations equations are used to forecast future variables that replace unobservable expectations. These variables are then used to estimate production and adjustment parameters. Rajagopal and Shah (forthcoming) incorporate aspects of these models into a production structure framework to evaluate investment incentives in place in Mexico, Pakistan and Turkey.

4. Effective Tax Rate and Return-Over-Cost Models

Feldstein (1987) is the proponent of an average effective tax rate approach to incentive evaluation. Feldstein posits that net investment is dependent on the net-of-tax real return to capital. The net-of-tax real rate of return depends on the effective tax rate which is defined as the ratio of a comprehensive measure of all taxes assessed on capital income to operating income less depreciation. Shah and Slemrod (1991) explored the relationship between average effective tax rate and inward foreign direct investment and found it to be negatively correlated.

The return-over-cost model (also presented by Feldstein) quantifies investment incentives by contrasting the maximum potential net return (MPNR) on a standard investment project with the cost of funds (COF). MPNR is influenced by tax incentives. Whenever the MPNR exceeds the COF, firms have an incentive to acquire more capital.

5. Marginal Effective Tax Rate Model

This broad approach attempts to capture the provisions of the tax code that affect a marginal investment. Tax incentives lower the marginal effective tax rate and thereby encourage additional investment in the tax-preferred activity until after-tax rates of return are equalized. Industry/sector-specific marginal effective tax rates are often used to stimulate investment behaviour on an *ex ante* basis.

Marginal effective tax rate methodology has been applied to examine the incentives through the corporate tax system in a number of countries. Recent applications include Brazil (Estache and Gasper, 1992), Malaysia (Boadway, Chua and Flatters, 1992), Mexico (Shah and Slemrod, 1991), Korea (Kwack, 1988), ASEAN (Manasan, 1988), Philippines (Manasan, 1988), Sri Lanka (Shah, 1988), Colombia (McLure and Zodrow, 1991), Thailand (Leechor and Mintz, 1991). These studies conclude that tax incentives as currently structured in these countries generally lead to windfall gains to investment actvities

that would have taken place anyway, and have little impact on generating new investment. Instead, often the prevailing incentives accentuate intersectoral and interasset distortionary effects of taxation. Boadway, Chua and Flatters find that tax holiday in Malaysia imposes a penalty on the firms that are going to be unprofitable during the holiday period, and therefore is highly unlikely to be of value to weak or infant investors. Thus, while tax incentives matter, they must be properly designed and targetted to be effective instruments in furthering public policy objectives.

The application of marginal effective tax rate methodology to determine the incentive/disincentive effect of indirect tax system has recently been pioneered by Boadway, Chua and Flatters (forthcoming). They develop and apply such a methodology to an examination of the effects of indirect tax system in Malaysia and find that the distortionary effects of such taxes on investment far exceeds the distortionary impact of the direct tax system. Such taxes were seen to penalize the export sector but provide a net subsidy to import substitution industries and thereby undermine Malaysia's competitiveness. Boadway *et al*'s conclusions highlight an important aspect of tax policy for investment that is often overlooked in policy debates. Their work strongly underlines the importance of elimination of tax disincentives through the indirect tax system as a first priority for investment and export promotion in most developing nations.

Shah and Slemrod (1991) examine the tax sensitivity of foreign direct investment in Mexico by incorporating marginal effective tax rates on transfers and retained earnings in investment equations. They conclude that FDI in Mexico is sensitive to tax regimes in Mexico and the U.S.A., to the credit status of multinationals, to country credit ratings, and to the regulatory environment.

A major limitation of the marginal effective tax rate analysis is that it tells us nothing about the actual behavioural responses to various incentives per dollar of forgone revenues. To answer this question, one needs to use marginal effective tax rates in further analysis as done for example by Shah and Slemrod (1991). Marginal effective tax rate analyses also usually ignore tax capitalization and foreign tax credit provisions. These calculations can also be in error for ignoring other taxes and non-tax policies. A cost of capital framework embodied in the production structure models overcomes the standard limitations of an effective tax rate analysis.

D. The Production Structure Approach

The essence of this approach is that taxes influence factor utilization, adjustment and output expansion through changes in factor prices and through their impact on technological change. A dynamic version of this approach (the variable profit function) recognizes capital as a quasi-fixed factor in the short run, so adjustment can only take place at a cost and with significant lags. Thus the short-run impact of

tax policy would be significantly different from its long-run impact. The approach provides estimates as to the stimulative (direct and induced) effects of public policy measures per dollar of foregone revenues. It also yields as a by-product shadow prices of quasi-fixed inputs, estimates of elasticities of factor substitution, output elasticities of factor demand and own price elasticities of product demand. These elasticity parameters are useful for studies dealing with tax analysis, trade liberalization, cost of capital and general equilibrium modelling of public policy changes. Much of production structure modelling is of recent origin (see Bernstein and Nadiri, 1988) and its applications to tax incentives evaluation in both industrial and non-industrial countries have just begun (see Bernstein and Shah, forthcoming, Rajagopal and Shah, forthcoming, Shah and Baffes, forthcoming and Shah, 1992).

In order to estimate the impact of taxes on factor substitution, technological change and output expansion, one needs cost or profit functions which embody flexible functional forms with fewer *a priori* restrictions. Typically, the production structure of the economy is unknown to a policy analyst, and often Cobb-Douglas and C.E.S functional forms are assumed, as is common in most CGE work. This choice runs the risk of choosing a specification that places inaccurate restrictions on output and factor price elasticities and hence yields misleading policy conclusions. Fortunately, in recent years, significant advances have taken place in modelling production structures but empirical work is significantly lacking in tax policy implications of this new technology both in advanced countries and developing nations.

To estimate the cost structure, one is faced with several modelling strategies. Broad choices in this respect include static and dynamic dynamic formulations. A static equilibrium framework is easier to implement but is useful only under a special set of circumstances when there are no indivisibilities and rigidities in the system, and adjustment is costless and instantaneous. These conditions are unlikely to be fulfilled in any practical economic environment, let alone in a developing country. This framework would lead to misleading policy prescriptions if quasi-fixed factors indeed diverge from their static equilibrium levels in the short run. Thus, it is essential that appropriate tests of static equilibrium must precede actual estimation in this framework. This framework, in any case does not distinguish between short-run and long-run behavioural responses.

In an explicitly dynamic framework, on the other hand, factor disequilibrium is recognized, adjustment costs are explicitly modelled, and an expectation hypothesis is specified. The adjustment costs are usually treated as internal to the firm, and are measured by the reduction in output supply that results when variable factors are pulled away from producing output to adjust firm's capital stock. Thus, a firm increases its stock of a given quasi-fixed factor as long as the present value of future additions to output is at least as great as the cost of bringing new capital on stream as measured by the sum of the after-tax

user cost of capital and the reductions in current output attributable to capital adjustment. This framework enables the researcher to trace the dynamic adjustment path under specified conditions. Explicitly dynamic frameworks have recently been utilized to address tax policy issues for developing countries. These studies and their results are briefly reviewed here.

Bernstein and Shah (forthcoming) develop a dynamic model of production (variable profits function) to analyze the impact of tax policies on output supply and input demands for producers operating in selected industries in Mexico, Pakistan and Turkey. Tax instruments considered include corporate income tax rate, investment tax credit rate, investment allowances, capital cost allowance rate, payroll tax rate and sales tax rates on intermediate inputs. The dynamics of production in their model arises from internal adjustment costs associated with the installation of capital stock into production process. Capital inputs differ from other factors of production because there are costs arising from capital adjustment. The model formulation allows the speed of capital adjustment to be estimated internally. Besides the dynamic nature of the model, there are other interesting features. Output supply is endogenous and is not solely a function of factor demand or of investment. Product markets are not assumed to be purely competitive. The nature of firm interdependence governs the structure of product markets. Lastly, there are financial capital markets imperfections, as firms are constrained by the rate of return that can be earned on their financial capital. This model was applied to Mexican, detergents and other chemicals industries using data for the period, 1970 to 1983; to Pakistani apparel and leather products industries for the period 1966 to 1984; and to Turkish electrical machinery, non-electrical machinery and transport equipment industries for the period 1973 to 1985. Tax incentives evaluated for these industries included: investment tax credits, investment allowances, accelerated capital consumption allowances and corporate income tax rate reductions. For each of these incentive measures estimates on revenue losses per dollar of investment were derived in short, intermediate and long runs (see Table 4).

Bernstein-Shah model results suggest that taxes did matter for production and investment decisions for the six industries analyzed in the three countries and further that some tax incentives were more effective than others in investment stimulation per dollar of revenue loss to the treasury. Among the incentive measures examined, investment allowances available only to Turkish industries proved to be cost-effective instruments for investment promotion; and investment tax credit and accelerated depreciation provisions had a mixed success while corporate tax reductions met with dismal failure in promoting investment in a cost-effective manner in all cases for all countries. In terms of their long run impacts, investment tax credits were cost-effective in two of the four industries studied but were only marginally cost-effective in one of these two success cases. Accelerated capital consumption allowances

also registered a similar performance and had incremental benefit-cost ratio exceeding one in the long run for four out of seven industries studied with the ratio being close to 1 in one of these four cases. Corporate tax rate reductions stimulated investments but resulted in revenue losses exceeding this stimulative impact in all cases and in all runs considered in this study. Note that corporate tax rate reductions apply to a larger base of pre-tax profits than the smaller base of current investments relevant for investment tax credits. In terms of the effectiveness of these incentives by location, investment allowances worked well in Turkey while in Mexico both the investment tax credit and accelerated capital consumption allowances met with mixed results and none of the incentives worked well in Pakistan. In Pakistan failure of the tax incentives regime in part may be attributable to political instability and economic uncertainty for a significant part of the period studied.

Shah and Baftes (forthcoming) employ a flexible accelerator type dynamic factor demand models with endogenous capacity utilization to examine the effectivess of tax incentives available to large-scale private manufacturing industries in Pakistan using data for the period 1956 to 1985. Tax incentives measures evaluated include: investment tax credit, full expensing of R&D investment and corporate income tax rate reductions. They find that while investment in physical and knowledge capital were sensitive to tax measures, the elasticity values were without exception quite small. Further, the incremental benefit-cost ratios associated with changes in investment tax credit and corporate tax rate were smaller than one in the short run. The full-expensing option for R&D was found to be cost-effective (see Table 4).

Rajagopal and Shah (forthcoming) argue that analyses of the effectiveness of tax incentives can be considerably enriched by explicitly incorporating into the analyses the industrial market structure of the industry at hand. They propose an empirical procedure to test the market power hypothesis. Such a test has important implications for the effectiveness of fiscal incentives for investment. If the producers in an industry have market power, they may be able to shift taxes forward completely so that any tax incentive would simply result in windfall gains for the firms in such an industry. On the other hand, in a competitive industry producers are not able to shift taxes forward completely so that tax incentives can stimulate investment. Rajagopal and Shah test the market power hypothesis empirically using data for selected industries: in Turkey, chemical and petroleum derivatives; in Pakistan, textiles as well as chemicals and pharmaceuticals. In addition, they also examine the impacts of investment tax credits (credits against tax liability), investment allowances (deductions against taxable income) and R&D expensing on production and investment decisions and government revenues. They introduce three

empirical innovations in this study. First, they specify an expression for the rental price of capital consistent with rational rather than static expectations. Second, instead of assuming perfect competition, they implement an empirical test of market power. Third, they empirically derive an incremental benefit-cost ratio for each of the incentives evaluated. They conclude that firms in those industries had limited market power and were thus able to shift taxes forward only partially. Thus, tax incentives did have an impact on production and investment decisions of firms in those industries. These impacts, however, varied greatly across different industries and in three out of five cases, tax incentives measures resulted in higher revenue losses as compared to their stimulative impacts on investment in physical or knowledge capital (see Table 4). Investment tax credit showed a mixed performance. It was cost effective for Pakistani chemicals and pharmaceutical industries but was ineffective for the textiles industries. Investment allowances also had little impact on investment in Turkish chemicals and petroleum derivatives industries. R&D expensing was stimulative for Pakistani chemicals and pharmaceuticals industries but was of minor consequence for stimulating investment in Turkish chemicals and petroleum derivatives industries.

In conclusion, these econometric results suggest that investment promotion objectives are not well served by corporate tax rate reductions in developing countries. The use of investment tax credit, investment allowances and accelerated capital consumption allowances as a part of this strategy also requires careful attention to their design (refundability of investment tax credits and carry forward of investment allowances and accelerated depreciations) and close monitoring of their impacts on investments and government revenues.

E. Computable General Equilibrium Models

A large majority of complex interactions in an economy are assumed away by partial equilibrium analysis. An applied general equilibrium model, on the other hand, can provide a disaggregated view of the economy and thereby yield quantitative estimates of all important interactions. It is, therefore, a valuable tool in assessing relative merits of alternative tax policy changes.

Applied general equilibrium analysis entails several sequential steps. First, basic data are collected from a variety of sources. These data are then adjusted for microconsistency. Next the choice of model, functional forms and elasticity parameters are specified. Parameter values for model functions are then determined through calibration. A replication test is carried out to check that the calibration parameter values are consistent with the original data on quantities and prices and the assumed model structure. Once this replication test is passed, a policy change is specified and a new (counterfactual)

equilibrium is computed. Policy evaluation is then based on pairwise comparison between the benchmark and new equilibrium.

Four recent studies have employed computable general equilibrium analysis to evaluate the impacts of tax incentives. Clarete (forthcoming) utilizes a static general equilibrium model to examine the effects of tax rebates and duty drawbacks on imported machinery and equipment by priority industries. The author observes a strongly stimulative impact of these incentives on investment. These conclusions, however, must be considered tentative, as the author employed a static model. The use of a dynamic model might well lead to different qualitative and quantitative conclusions.

Trela and Whalley (1991) also utilize an applied general equilibrium model to exaqmine the impact of rebates of direct and indirect taxes on exports, investment tax credits, and tax holidays on Korean growth performance. They conclude that tax policy accounted for less than one-tenth of the growth of the Korean economy during 1962-82. These results are, however, tentative as the model developed for this purpose did not explicitly take into account savings, investment and the accumulation of human capital. The authors nevertheless, expect these results to stand in a more complete analysis of Korean growth performance.

Feltenstein and Shah (forthcoming a, forthcoming b) examine the relative efficacy of tax incentives by using disaggregated dynamic computable general equilibrium models for Mexico and Pakistan. In both applications, they find that while the investment tax credit was more stimulative in its impact on private capital formation, corporate tax rate reductions appeared superior in terms of its impact on aggregate output and consumer welfare.

VI. Concluding Remarks

This has been a rather wide-ranging survey of some of the effects of tax incentives on the decision to invest in developing countries. Much of the discussion has been of a conceptual nature. This reflects the fact that the investment decision is inherently a rather complicated one which is not completely understood. There are obviously many factors which affect the decision to invest. Only some of them are conventional price and income effects that economists are used to analyzing. Our analysis has concentrated heavily on these effects.

At the same time, there are many more intangible influences on the decision to invest, many of them specific to a given country. These include the political climate, the reliability of fiscal commitments, capital markets and the availability of cash, and both economic and political uncertainty. It is very difficult to capture all of these factors in an analytical framework, though some advances have

been made on a piecemeal basis. It will ultimately be up to empirical analysis to indicate how successful investment incentives are likely to be in a given setting. To date, such empirical analysis has been rather limited, though that which exists is quite suggestive. We have provided a brief survey of some of the more recent work. Obviously, much remains to be done.

Even in the absence of convincing empirical analysis, there is much to be learned from theoretical reasoning about the design of investment incentives. In particular, the following factors are important considerations to be addressed in evaluating and designing investment incentives in developing economies:

1. The Effect on the METR. Even simple tax incentives can have perverse effects on the marginal incentive to invest. Many schemes have relatively generous write-offs to begin with, so generous that a negative marginal effective tax rate is not uncommon. In these circumstances, tax rate reductions (including tax holidays) can discourage investment. Investment tax credits are more likely to be effective.

2. The Effect on Loss Firms. Many of the firms that investment incentives are intended to assist are those which are more likely to be in a loss position. These include small growing firms and firms in risky environments. Incentives which do not have generous loss-offsetting or refundability provisions will be of limited use in these circumstances.

3. The Effect on Cash Flows. Firms in need of assistance may also be those which are relatively strapped financially. Imperfections in capital markets may make it difficult to get outside financing. Again, incentives which improve the cash flows of firms may be much more effective than those which do not. The presence of refundability may be especially important here. Simply adopting cash flow type costing principles with refundability may be much more effective than reducing tax rates.

4. The Effect on Foreign Firms. A significant amount of investment in developing countries is done by foreign-owned firms. Since these firms are typically liable for taxation in their home countries, the manner in which foreign tax crediting arrangements apply is important in designing tax incentives. If the value of the incentive is fully offset by reduced foreign tax crediting, the incentive effect will be minimal.

5. Inter-Asset Effects. Many tax incentives affect different types of investment decisions in different ways. Thus, some measures may favor short- versus long-lived capital, others may affect machinery

relative to inventory, while others may favor some industries relative to others. In these case, while the incentive may encourage investment selectively, it will also cause inefficiencies from distortions in the way in which capital is allocated.

More generally, there are a variety of other factors that must be considered in designing tax incentives. For one, inflation is typically quite high in developing countries, and investment can be adversely affected by that The system of incentives should offset the effects of inflation. Another problem common in developing countries is that of tax evasion. There has been relatively little work done on the implications of tax evasion for investment activity, but presumably it is important. Also, one of the more important roles of investment in developing countries, especially foreign investment, is to facilitate the transfer of technology. Investment incentives should be designed with that in mind. There may also be other non-economic objectives fulfilled by investment, such as social, environmental and regional. Finally, taxes can have effects on the organization of firms, and can encourage takeovers, mergers and bankruptcies. This should also be borne in mind in designing tax incentives. Unfortunately, the analysis of investment incentives has not itself been developed far enough to take these considerations into account.

Table 1: Marginal Effective Corporate Tax Rates for a Profit-making Firm, 1983-87

Pre-1989 Budget Reform			
Year	Debt Financing	Retained Earnings	Debt and Ret.Earn.
1983	-.0436	.0112	-.0223
1984	-.0433	.0098	-.0231
1985	-.0272	.0066	-.0155
1986	-.0277	.0054	-.0158
1987	-.0308	.0091	-.0118

Post-1989 Budget Reform			
Year	Debt Financing	Retained Earnings	Debt and Ret. Earn.
1983	-.0331	.0073	-.0173
1984	-.0329	.0064	.0179
1985	.0207	-0043	-.0121
1986	-.0211	.0035	-.0123
1937	-.0235	.0060	-.0095

Source: Boadway, Chua, and Flatters

Table 2: Marginal Effective Corporate Tax Rates for a Profit-Making Pioneer Firm, 1983

Pre-1989 Budget Reform			
Profile	Debt Financing	Retained Earnings	Debt and Ret. Earn
Yr 1	-.0118	-.0135	-.0124
Yr 2	-.0158	-.0176	-.0165
Yr 3	-.0204	-.0219	-.0209
Yr 4	-.0255	-.0263	-.0258
S.S.	-.0436	-.0112	-.0223

Post-1989 Budget Reform			
Profile	Debt Financing	Retained Earnings	Debt and Ret. Earn.
Yr 1	.0302	.0365	.0325
Yr 2	.0301	.0353	.0320
Yr 3	.0300	.0339	.0315
Yr 4	.0296	.0324	.0307
S.S.	-.0331	.0073	-.0173

Source: Boadway, Chua, and Flatters (1989)

Table 3: Marginal Effective Corporate Tax Rates for a Tax Loss Firm, 1983

Pre-1989 Budget Reform			
Year	Debt Financing	Retained Earnings	Debt and Ret. Earn.
Yr 1	-.0022	.0294	.0101
Yr 2	-.0041	.0277	.0083
Yr 3	-.0064	.0259	.0061
Yr 4	-.0092	.0240	.0037
S.S.	-.0436	.0112	-.0002

Post-1989 Budget Reform			
Year	Debt Financing	Retained Earnings	Debt and Ret. Earn.
Yr 1	-.0018	.0205	.0069
Yr 2	-.0030	.0191	.0056
Yr 3	-.0045	.0176	.0041
Yr 4	-.0062	.0160	.0024
S.S.	-.0331	.0073	-.0173

Source: Boadway, Chua, and Flatters (1989)

Table 4
Investment in Physical and Research Development Capital
Per Dollar of Lost Tax Revenue
A Summary of Empirical Evidence Based on Dynamic Production Structure Models

Authors	Tax Instrument	Short Run	Intermediate Run	Long Run
Bernstein & Shah (forthcoming)	Investment Allowance			
	Turkey: Electrical Machinery Industries	0.51	0.84	1.43
	Turkey: Non-Electrical Machinery Industries	1.17	1.92	3.27
	Turkey: Transport Equipment Industries	0.72	1.19	2.02
	Investment Tax Credit			
	Pakistan: Apparel Industries	0.16	0.29	1.07
	Pakistan: Leather Industries	0.07	0.12	0.27
	Mexico: Detergents Industries	1.29	1.71	1.90
	Mexico: Other Chemical Industries	0.50	0.66	0.74
	Accelerated Capital Consumption Allowances			
	Turkey: Electrical Machinery Industries	0.36	0.60	1.02
	Turkey: Non-Electric Industries	0.83	1.37	2.33
	Turkey: Transport Industries	0.51	0.84	1.44
	Pakistan: Apparel Industries	0.13	0.25	0.90
	Pakistan: Leather Industries	0.06	0.10	0.23
	Mexico: Detergents Industries	0.96	1.26	1.41
	Mexico: Other Chemicals Industries	0.37	0.49	0.55
	Corporate Income Tax Rate Reductions			
	Turkey: Electrical Machinery Industries	0.02	0.03	0.05
	Turkey: Non-Electrical Machinery Industries	0.06	0.10	0.16
	Turkey: Transport Industries	0.13	0.29	0.37
	Pakistan: Apparel Industries	0.001	0.002	0.007
	Mexico: Detergents Industries	0.03	0.04	0.05
	Mexico: Other Chemicals Industries	0.01	0.01	0.01
Rajagopal & Shah	Investment Tax Credit			
	Pakistan Textile Industry	0.02	-	0.10
	Pakistan Chemical & Pharmaceutical Industries	2.60		
	Investment Allowance			
	Turkish Chemicals & Petroleum Derivatives Industries			
	R&D Expensing			
	Pakistan Chemical & Pharmaceutical Industries	1.75		
	Turkish Chemical & Petroleum Derivatives Industries	0.008		
Shah & Baffes	Investment Credit			
	Pakistan Total Private Manufacturing Industries	0.95		
	R&D Expensing			
	Pakistan Total Private Manufacturing Industries	1.49		
	Corporate Tax Rate Reductions			
	Pakistan Total Private Manufacturing Industries	0.71		

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List of Annex Tables

Table A.1

STATUTORY CORPORATE INCOME TAX RATES

Country		Standard (%)	Special	(%)	Surcharge (%)
Industrial Countries					
USA		34			
Canada		43.5			
Australia		39			
Japan					
New Zealand		33			
Austria		30			
Belgium		39			
Denmark		40			
Finland		23	munic.	14	
			Church	1	
France		34			
Germany		50			
Greece		46	Productive Inv. under 1892 law	40	
Ireland		40	Manuf.	10	20
Italy		36			
Netherlands		40			
Norway	state	27.8	prod or pipeline		
	munic.	23.0	transp. of oil	50.8	
Portugal		36			
Spain		35			
Sweden		30			
Switzerland		22-35			
United Kingdom		35			
Developing Countries					
Africa					
Botswana		30			
Cameroon		38.5			
Congo		49	public & agricult. business	36.4	
Ivory Coast		40			
Gabon		40			5
Ghana		50	real estate dev. & farming	45	
Kenya		40	mining co.	27.5	
Liberia		50			
Malawi		45			
Mali					
Mauritius		35	medical & agriculture	15	
Morocco		40			
Nigeria		40	manuf, agric & mining	20	

Table A.1 (cont.)

Country	Standard (%)	Special (%)		Surcharge (%)
Senegal	35			
South Africa	50			9
Swaziland	37.5	mining	27	
Tanzania	50	mining	22.5	
Uganda	40			
Zaire	50			
Zimbabwe	45			
Asia				
China, People's Rep.	40			10
Fiji	37.5			
Hong Kong	16.5			
India	45	private corp	50	15
Indonesia	35	public corp	40	
Korea, Republic of	34			7.5
Malaysia	35			
Pakistan	30			10
Papau New Guinea	48	mining	35	
		petroleum	50	
Philippines	35			
Singapore	31			15
Taiwan	25			
Thailand	35			
Western Samoa	48			
Europe				
Cyprus	25			
Czechoslovakia	55			
Hungary	40			
Malta	35			
Turkey	46			
Middle East				
Egypt	42	industrial & export		34
		oil production		40.55
Iran	12-75			
Kuwait	55			
Oman	50			
Saudi Arabia	45			

Table A.1 (cont.)

Country	Standard (%)	Special	(%)	Surcharge (%)
Western Hemisphere				
Antigua	40			
Argentina	20			
Barbados	35	residential construction co.	20	
Belize	45	oil prod. co.	50	
		public co.	35	
Bolivia	3	petroleum	40	
Brazil	30	agriculture	25	5
Chile	15			
Colombia	30			
Costa Rica	30			
Dominican Republic	46			3
Ecuador	25			
El Salvador	30			
Guatemala	34			
Guyana	35	investment co.	Nil	
Honduras	35			15
Jamaica	33.33	life insurance	7.5	
Mexico	35			
Netherlands Antilles	43			15
Panama	50			
Paraguay	30			
Peru	30			
St. Lucia	33.3			
Trinidad & Tobago	40	life ins.	15	
		petroleum	45	
Uruguay	30			
Venezuela	50	mining	60	
		oil co.	67.7	

Source: Price Waterhouse (1991). Corporate Taxes: A Worldwide Summary. New York.

TABLE A.2

NON-RESIDENT CORPORATION WITHHOLDING TAX RATES

Country	Non-Treaty Dividends	Country Interest	Royalties	Treaty Dividends	Country Interest	Royalties
Industrial Countries						
USA	30	30	30	15-30	0-30	0-30
Canada	25	25	25	10-25	10-25	5-25
Australia	30	10		15-25	10	10-25
Japan	20	15/20	20	10-20	10-20	10-20
New Zealand	30	15	15	15-20	10-15	10-30
Austria	25		20	0-25	0-10	0-20
Belgium	25	10	25	10-20	0-25	0-25
Denmark	30		30	0-30		0-30
Finland	25	30	30	0-25	0-25	0-25
France	25	45	33.33	0-25	0-45	0-33.33
Germany	25	25	25	15-25	0-25	0-25
Greece	42-50	46,10	25	25-50	0-46	0-25
Ireland	0	30	30		0-30	0-30
Italy	32.4	12.5-30	30	0-32.4	0-30	0-21
Netherlands	25			0-25		
Norway	25			10-25		
Portugal	30	20/25	15	12-15	10-15	5-15
Spain	25	25	25	5-18	0-15	5-15
Sweden	30	0		0-30		
Switzerland	35	35		5-35	5-35	
United Kingdom	0	25	25	0/10	0/25	0/25
Developing Countries						
Africa						
Botswana	15	15	15	15	15	15
Cameroon	25		15			
Congo	20	15-30	20			
Ivory Coast	12-18	9-18	20			
Gabon	18	10	10			
Ghana	30	30				
Kenya	15	12.5	20	15	12.5	15-20
Liberia	15	15	30			
Malawi	15	15	15			
Mauritius						
Morocco	15	10	10	5-15	10	10
Nigeria		15	15			
Senegal	16		35			
South Africa	15		0/15	7.5-15		0-15
Swaziland	15	10				
Tanzania	20	20	30	10-20	12.5/20	15-30
Uganda						
Zaire	20	20	20		0-30	
Zambia	20	30	30	0/20	10	0-15
Zimbabwe	20	10	20	20		7.5-20

Table A.2 Non-Resident Corporation Withholding Tax Rates (Continued)

Country	Non-Treaty Dividends	Country Interest	Royalties	Treaty Dividends	Country Interest	Royalties
Asia						
China, People's Rep	20	20	20	7-15	7-10	6-15
Fiji	30	15	25	15-20	10	10-15
Hong Kong						
India	25	25	30	15-25	5-25	10-30
Indonesia	20	20	20	15-20	0-20	10-20
Korea, Republic of	25	25	25	10-20	0-15	0-15
Malaysia		0 or 20	15		0-20	0-15
Pakistan	15	50-60	50-60	8-15	0-30	0-25
Papau New Guinea	17	48	10-30			
Philippines	30-35	30-35	30-35	15-25	max 25	15-25
Singapore		31	31	0-25	0-25	0-25
Taiwan	35	20	20			
Thailand	20	10-25	25	10-20	3-25	5-20
Western Samoa	15	15	15			
Europe						
Cyprus	30	20-25	10	0-20	0-25	0-10
Czechoslovakia	25	25	25-30	0-25	0-15	0-25
Hungary			20			0-40
Malta	35	35		30-35	5-15	0-12.5
Turkey		10	25	10-25	10-15	10-12
Soviet Union (Former)						
Middle East						
Egypt		32	25			
Iran	12-75	12-75	12-75	20	15	10
Kuwait						
Oman						
Saudi Arabia						
Western Hemisphere						
Antigua		20	21.6/28.8		20	25
Argentina	20	14.4	15	15-20	10-14.4	15-28.8
Barbados	15	15	25	0-15	5-15	0-15
Belize		25			25	25
Bolivia	10		25	10	10	
Brazil	25	25	40	15-25	10-25	10-25
Chile	35					
Colombia	19	30	25			
Costa Rica	15	15	35			
Dominican Republic	35	35		18	18	18
Ecuador	36					
El Salvador	22	22	22			
Guatemala	12.5	25	34			
Guyana	11.2-13.3	25	10			
Honduras	15	5	35			

Table A.2 Non-Resident Corporation Withholding Tax Rates (continued)

Country	Non-Treaty Dividends	Country Interest	Royalties	Treaty Dividends	Country Interest	Royalties
Jamaica	33.33	33.33	33.33	15-33.33	12.5-33.3	0-10
Mexico		15-35	15/35			
Netherlands Antilles						
Panama	10		50			
Paraguay	10	30	30			
Peru	10	0-45	28			
St. Lucia			25			
Trinidad & Tobago	25	25	20	5-25	0-30	0-30
Uruguay			40			
Venezuela	20					

Source: Price Waterhouse (1991). Corporate Taxes: A Worldwide Summary. New York.

TABLE A.3

DEPRECIATION RULES

Country	Depreciation Methods	Asset Price	Initial Allowance	Basis of Inventory Valuation	Accelerated CCA	
Industrial Countries						
USA	ACRS			FIFO,LIFO		
Canada	DB			C/M		
Australia	SL,DB			C/M/R	yes	
Japan	SL,DB	CURR		All methods		yes
New Zealand	DB			C/M/R		
Austria	SL		20%	MA		
Belgium	SL,DDB			C/M/LIFO		
Denmark	DB		30% ship ind.	C/M		
Finland	DB			FIFO		yes
France	SL,DB			C/M/FIFO/AC		
Germany	SL,DB			C/FIFO/LIFO		
Greece	SL			C/M/LIFO		
Ireland	IME	CURR		C/M/LIFO/FIFO		yes
Italy	SL	CURR		LIFO		
Netherlands	SL.DB			C/M/FIFO/LIFO		
Norway	DB			C/M/FIFO		
Portugal	SL,DB			C/AC/FIFO		yes
Spain	SL			C/AC/FIFO		
Sweden	BOOK			C/M/FIFO		
Switzerland	SL,DB			AC/FIFO		
United Kingdom	DB			C/M		
Developing Countries						
Africa						
Botswana	SL		25% ind.Bldg.	C		
Cameroon	SL			C/M		
Congo	SL			C/M/LIFO		yes
Ivory Coast	SL	HIST		C/M/LIFO		yes
Gabon	SL			C/M/FIFO/AC		yes
Ghana	DB		10% Bldg. 25% mining	C		
Kenya	DB	CURR		AC/M		
Liberia	SL	HIST		LIFO		
Malawi	SL			C		
Mauritius	SL	HIST	30% ind./50% hotels	C/M		
Morocco	SL			FIFO/AC		
Nigeria	SL		5-30% manuf.,cons.	FIFO		
Senegal	SL			C/M		yes
South Africa	DB,SL			C/M		
Swaziland	DB		50% manuf.	FIFO/AC		

Table A.3 (continued)

Country	Depreciation Methods	Asset Price	Initial Allowance	Basis of Inventory Valuation	Accelerated CCA
Tanzania	SL\DB			C/NRV	
Uganda	DB			C/M/FIFO	
Zaire	SL			C/M	
Zambia	SL,DB			C/M/FIFO	
Zimbabwe	SL,DB			C/M	yes
Asia					
China, People's Rep	SL			C/FIFO/WA	yes
Fiji	PC		30% mach., 10% bldg.	C/FIFO	yes
Hong Kong	SL		20% ind.bldg. 60% mach.& equip.	C/M/LIFO/FIFO	
India	WDV	HIST		C/M	
Indonesia	WDV,SL			AC/FIFO	
Korea, Republic of	DDB,SL	CURR		C/M/LIFO	
Malaysia	SL			C/M	
Pakistan	DB,SL			C/M/L	
Papau New Guinea	SL,DB			C/M/R	
Phiiippines	SL			C/M	
Singapore	SL			AC/FIFO	
Taiwan	SL/DB			C/FIFO/LIFO	yes
Thailand	SL,DB,SD			C/M	
Western Samoa	DB			C/M	
Europe					
Cyprus	SL	HIST		C/FIFO	yes
Czechoslovakia	SL				
Hungary	SL			C/FIFO/LIFO	yes
Malta	DB,SL			C/M	
Turkey	DB,SL			AC	
Soviet Union (Former)	SL			CP	
Middle East					
Egypt	DB,SL	HIST		LIFO/FIFO	
Iran	DB,SL			C/M	
Kuwait	SL	CURR		FIFO/LIFO	
Oman	SL			FIFO/LIFO	yes
Saudi Arabia	SL			AC/FIFO	
Western Hemisphere					
Antigua	DB		2% bldg	C/FIFO/AC	
Argentina	SL	CURR	2% bldg.	C/M	
Barbados	SL		1% cons.bldg. 2% ind.bldg.	C/FIFO/AC	

Table A.3 (continued)

Country	Depreciation Methods	Asset Price	Initial Allowance	Basis of Inventory Valuation	Accelerated CCA
			10-20% oil production		
Belize	WDV			All methods	
Bolivia	SL			R/NRV	
Brazil	SL			C/M	
Chile	SL	CURR		Repl.Cost	yes
Colombia	SL	HIST		LIFO	
Costa Rica	SL,SD			C/FIFO/LIFO/AC	
Dominican Republic	SL				
Ecuador	SL			FIFO/AC/LIFO	
El Salvador	SL,DB			FIFO/AC/LIFO	
Guatemala	SL			AC/FIFO	
Guyana	SL,DB			C/M	yes
Honduras	SL			C/M/LIFO	
Jamaica	DB	Hist.		C/M	
Mexico	SL	Curr.		M/LIFO	
Netherlands Antilles	SL,DB			LIFO	yes
Panama	SL,DB,SD			FIFO/LIFO/AC	
Paraguay	SL			All Methods	
Peru	SL	Curr.		AC/FIFO	
St. Lucia	DB		20% ind. bldg.& mach.	C/M	
Trinidad & Tobago	SL			C/M	yes
Uruguay	SL			FIFO/LIFO	
Venezuela	SL	Hist.		C/M	

SL=straight line, DB=declining balance, DDB=double declining balance,
WDV=written down value, ACRS=accelerated cost recovery system,
IME=immediate expensing, SD=sum of year's digits, PC=prime cost

manuf=manufacturing, ind.=industry, cons.=construction
bldg.=building, mach.=machinery, equip.=equipment.

Source: Price Waterhouse (1991). Corporate Taxes: A Worldwide Summary. New York.

TABLE A.4
CORPORATE TAX HOLIDAYS

Country	Period (Years)	Exemption	Treatment of Depreciation	Treatment of Losses	Other Features
Bangladesh	4-12	100%	Unused mandatory deductions carried forward	Not carried forward after holiday	5-30% of income invested in Government bonds.
Belgium	5	100%			Investments relating to real estate, land, plant and equipment
Bolivia	10	100%			
China	2	100%			Joint Ventures
Ecuador	5-15	100%			Special Projects
France	10	100%			Investment in underdeveloped areas
Guatemala	10	100%			
Ivory Coast	7-11	100%	Depreciation can be deferred indefinitely	Carried forward 8 years	National Investment Fund Levy - 10% tax fully recoverable at a rate that varies according to type of investment
Korea	5	100%			
Malaysia	5-10	100%	Depreciation delayed until end of holiday	Mandatory deduction of associated non pioneer loss pioneer loss only	Dividend exempt from personal tax
Malta	10	100%		carried forward indefinitely	Export oriented industries
Morocco	10-14	100% Zone IV 50% Zone III	Depreciation mandatory-carried forward in loss periods only	Four years carry forward	
Pakistan	5-10	100%			Corporations incorporated in Pakistan
Panama	20	100%			Established in a province other than Panama and Colon
Philippines	5	100%			
Thailand	3-8	100% 50% for 5 additional yrs	Depreciation mandatory	Pioneer and associated non-pioneer income and loss aggregated	

Source: Price Waterhouse (1991). Corporate Taxes: A Worldwide Summary. New York.

TABLE A.5
OTHER TAX INCENTIVES

	Investment Tax Credits	Investment Allowances	Export Incentives	Other Incentives
Industrial Countries				
USA	An energy investment credit is allowed for 10% of inv. in qualified energy property. Credit also available for expenditures related to the rehabilitation of older business real estate		Export related earnings of certain corporations receive preferential tax treatment	
Canada	20% tax credit for research exploration incurred in Canada. 100% deduction of intangible exploration costs	resource allowance equal to 25% of resource profits. mining and oil and gas activities		
Australia	150% deductions for research and development.			Accelerated deductions for capital expenditures on exploration and extraction of petroleum.
Japan		3.5 or 5% of acquisition cost for mach. and equip.	yes	
New Zealand			yes	
Belgium	4% tax deduction of qualifying investments.			
Denmark				Long term Danish state loans at a low rate of interest
Finland		yes, shipping ind.		
France	50% qualifying research expenditures			
Greece	defined by Law 1892	yes	deduction from taxable income of 1-3% of total exports	

Table A.5 Other Tax Incentives (continued)

Country	Investment Tax Credits	Investment Allowances	Export Incentives	Other Incentives
Industrial Countries				
Ireland				10% reduced rate corp. tax for manufacturing operations Cash grants for R&D
Italy				Loans at low i rates
Netherlands	18% deduction on Corp. taxes on investment up to Dfl51,000			
Norway		23% deduction of pre tax annual profit to a consolidation fund		
Portugal				Only 80% dividends and 80% interest bonds are subject to tax
Spain	General 5% tax credit may be obtained on new fixed assets R&D 15% tax credit on intangibles			
United Kingdom				Regional Selective Assistance grants are available in cash
Developing Countries				
Africa				
Botswana		extra tax reliefs on revenue or capital account will be granted for specific building developments.		
Cameroon		reduction of 15% of the customs duties on imported assets and raw materials.		
Ivory Coast		40-60% deductibles on expenditure	export subsidies	
Gabon		yes	New companies	

Table A.5 Other Tax Incentives (continued)

Country	Investment Tax Credits	Investment Allowances	Export Incentives	Other Incentives
Kenya		85% New building & hotels 35% Machinery	yes	
Liberia			yes	
Malawi		40% long term crops and land clearing		
Mauritius		30% Hotel 30% Building		reduced corp. tax 15%
Morocco			Exports 5 years 100% exemption of income tax	
Nigeria			Refund on import duty for export manufacturers	
Asia				
China, People's Rep				15%-30% reduction of tax rates on investment in underdeveloped areas
Fiji		55% hotels	yes	
Hong Kong				insurance & ship co. special tax provision
India		50% on new ships aircrafts, and machinery		
Korea, Republic of	Tax credit available up to 100% of capital expenditure on a factory.			
Malaysia		5% of FOB value for exports	yes	

Table A.5 Other Tax Incentives (continued)

Country	Investment Tax Credits	Investment Allowances	Export Incentives	Other Incentives
Pakistan	15% of the actual cost of machinery. Also available on acquiring machinery or plant on lease		55% rebate of tax attributable to export sales	
Papau New Guinea			Exception from income tax for 3 years	Quota protection
Philippines		50% deduction of incremental labor expenses in special areas	yes	
Europe				
Cyprus		reduction of taxable income for scientific research and patents	90% of profit or dividends	
Hungary		investment rebates up to 100% in manufacturing industries Available for joint venture		
Malta	30% plant & machinery 15% buildings	Tax free profits distributed to share holders 12% tax deductible training costs	yes	
Turkey		granted to comp. and individual tax payers at rates of 40-60% of the cost assets acquired in connection with specific projects		
Middle East				
Kuwait				Soft & Long term loans
Oman	15% of actual cost of machinery		Rebate of 50% of export tax	

Table A.5 Other Tax Incentives (continued)

Country	Investment Tax Credits	Investment Allowances	Export Incentives	Other Incentives
Antigua				An international business company may be formed with exemption from local taxation for 50 years provided it doesn't trade in Antigua
Argentina			Import duty drawbacks, nontaxable tax refunds Between 10-15% of FOB value export financing	
Barbados			Exporters outside the CARICOM have a depreciation allowance of 120% or 140% of actual cost. Export allowance 93% on sales where eligible sales exceed 81% of total sales	
Bolivia				upon approval, allowance of accelerated depreciation as a deduction of taxable income
Brazil			Excise and sales service tax exemptions are granted to exporters of manufactured goods	Sales of some capital equipment are exempt from state sales and service taxes
Chile			Reimbursement of taxes	Guaranteed income
Colombia			selected products receive income tax certificates of 5-12% export of nontraditional products, nontaxable tax certificates 20% of invoice value	

Table A.5 Other Tax Incentives (continued)

Country	Investment Tax Credits	Investment Allowances	Export Incentives	Other Incentives
Costa Rica		50% of reinvested profits deductible firm taxable income taxable income		
Dominican Republic		up to 50% deduction in projects in tourism and industry.		
Ecuador	Mining and tourism industry have special tax treatment		yes	
El Salvador		50% reduction in investment in new machinery and equipment	Full tax exemption and unrestricted remission of profits	
Guatemala	available for industries outside county of Guatemala		exempt of import and duties on machinery and equipment	
Guyana		70% equipment	50% of exports profits	
Honduras			10-20% rebate on exports	
Jamaica		Write off of 120% of cost of market equipment over a period of time		
Mexico	tax credits for expansion of small & micro industries		Duty free imports products to be re-exported	
Netherlands Antilles		8-12% Buildings	yes	
Panama				exemption of taxes to encourage expansion of local industries
Paraguay	Available			
Peru				Exemption from income tax in Frontier Zones

Source: Price Waterhouse (1991). Corporate Taxes: A Worldwide Summary. New York.

Table A.6

TAX TREATMENT OF LOSSES

Country	Loss Carry Forward No. of Years	Loss Carry Backward No. of Years
Industrial Countries		
USA	15	3
Canada	7	3
Australia	Indefinitely	1 or 0
Japan	5	
New Zealand	Indefinitely	
Austria	Indefinitely	
Belgium	Indefinitely	
Denmark	5	
Finland	5	
France	5	3
Germany	Indefinitely	
Greece	5	
Ireland	Indefinitely	3
Italy	5	
Netherlands	8	3
Norway	10	2
Portugal	5	
Spain	5	
Sweden	Indefinitely	
Switzerland	2	
United Kingdom	Indefinitely	1
Developing Countries		
Africa		
Botswana	5	
Cameroon	3	
Congo	3	
Ivory Coast	3	
Gabon	3	
Ghana	2	
Kenya	Indefinitely	
Liberia	5	
Malawi	Indefinitely	
Mauritius	Indefinitely	
Morocco	4	
Nigeria	4	
Senegal	3	
South Africa	Indefinitely	
Swaziland	Indefinitely	
Tanzania	Indefinitely	

Table A.6 (continued)

Country	Loss Carry Forward No. of Years	Loss Carry Backward No. of Years
Uganda	Indefinitely	
Zaire	2	
Zimbabwe	Indefinitely	
Zambia	Indefinitely	
Asia		
China, People's Rep.	5	
Fiji	6	
Hong Kong	Indefinitely	
India	8	
Indonesia	5 or 8	
Korea, Republic of	5	
Malaysia	Indefinitely	
Pakistan	6	
Papau New Guinea	7	
Philippines	Indefinitely	
Singapore	Indefinitely	
Taiwan	5	
Thailand	5	
Western Samoa	Indefinitely	
Europe		
Cyprus	Up to Dec. 1992	
Czechoslovakia	0	
Hungary	2	
Malta	Indefinitely	
Turkey	5	
Middle East		
Egypt	5	
Iran	Indefinitely	
Kuwait	Indefinitely	
Oman	5	
Saudi Arabia	0	
Western Hemisphere		
Antigua	6	
Argentina	5	
Barbados	9	
Belize	Indefinitely	
Bolivia	-	

Table A.6 (continued)

Country	Loss Carry Forward No. of Years	Loss Carry Backward No. of Years
Brazil	4	
Chile	Indefinitely	
Colombia	5	
Costa Rica	3-5	
Dominican Republic	3	
Ecuador	5	
El Salvador	7	
Guatemala	1-5	
Guyana	Indefinitely	
Honduras	3	
Jamaica	Indefinitely	
Mexico	5	
Netherlands Antilles	5	
Panama	0	
Paraguay	0	
Peru	4	
St. Lucia	6	
Trinidad & Tobago	Indefinitely	
Uruguay	3	
Venezuela	3	

Source: Price Waterhouse (1991). Corporate Taxes: A Worldwide Summary. New York.

Table A.7

SOURCE RULES FOR CORPORATIONS

Country	Rule	Treatment
Industrial Countries		
USA	Residence	Credit
Canada	Residence, Source	Credit
Australia	Residence, Source	Credit
Japan	Residence	Credit
Austria	Residence	
Belgium	Residence	Credit,
Denmark	Residence	Credit
France	Source	
Germany	Residence	
Italy	Residence, Source	Credit
Netherlands	Residence	Credit,
Norway	Residence	Treaty
Sweden	Residence, Source	Credit
Switzerland	Residence	Credit
United Kingdom	Residence	Credit
Developing Countries		
Africa		
Kenya	Residence	
Liberia	Source	
Morocco	Source, except dividends	
Nigeria	Residence, Source	
Zimbabwe	Source, except interest	
Zambia	Residence	
Asia		
China, People's Rep.	Source	
Hong Kong	Source	
India	Residence, Source	Treaty
Indonesia	Residence	Credit
Korea, Republic of	Residence, Source	Credit
Malaysia	Source, foreign income received	Credit
Pakistan	Residence	Credit
Philippines	Residence, Source	Credit
Singapore	Residence	Credit
Taiwan	Residence	Credit
Thailand	Residence, Source	

Table A.7 (continued)

Country	Rule	Treatment
Europe		
Hungary	Residence	
Turkey	Residence, Source	
Middle East		
Iran	Source	
Saudi Arabia	Source	
Western Hemisphere		
Ecuador	Source, interest and dividends	Credit
El Salvador	Source	
Guatemala	Source	Credit
Honduras	Residence	None
Jamaica	Residence	Treaty, Deduction
Mexico	Residence	Credit
Netherlands Antilles	Residence	Treaty
Panama	Source	
Peru	Residence	Credit
Trinidad & Tobago	Residence	Credit
Uruguay	Source	
Venezuela	Source, with exceptions	

Source: Prince Waterhouse (1991). Corporate Taxes: A Worldwide Summary. New York. Conrad (1989).

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